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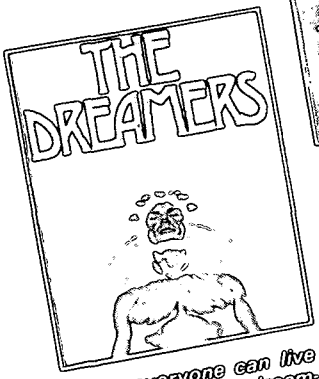

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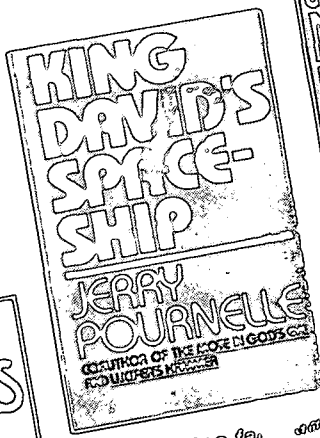

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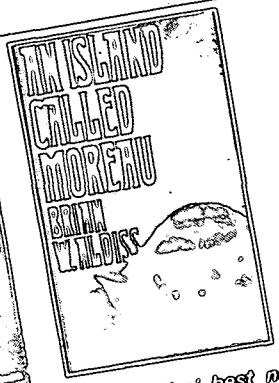

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EDITORIAL: WHAT'S A GALAXY?

by Isaac Asimov

art: Frank Kelly Freas

There are some words toward which science fiction readers take a proprietary attitude. One of them is "galaxy." We were familiar with that word when no one else but professional astronomers ever used it or understood it. We even named a magazine for it: one which, in its time, was an important addition to the field.

I myself feel particularly associated with the word, since in my *Foundation Trilogy* I made the Galactic Empire a science fictional household word.

It irritates me dreadfully, therefore, that the word is commonly used in "sci-fi" movies and television in a way that clearly shows the perpetrators haven't the faintest notion what a galaxy is, and don't care either.

They routinely describe events as taking place "in another galaxy," or extra-terrestrials as coming "from another galaxy," when what they really mean is "another planetary system."

There are 300,000,000,000 stars in the galaxy we live in; and that gives us sufficient scope, surely, for other intelligences and distant events without having to find them in "other galaxies" every single time.

To put it into familiar terms, we need only imagine a movie in which every time some human stranger arrives at a gathering someone says, "And this is Tony Smith, from another continent," when what they really mean is: "And this is Tony Smith, from out of town."

To be forever saying "from another continent" instead of "from out of town" or "from a city out west" strongly indicates that the speaker doesn't know the meaning of the word "continent."

So what is a galaxy? Since I've promised to discuss SF terms now and then, let's take up that question.

The tale begins with the fact that ancient observers of the sky noticed a dim, foggy band that circled the heavens and divided it into two equal halves. It was not an atmospheric cloud of any kind,

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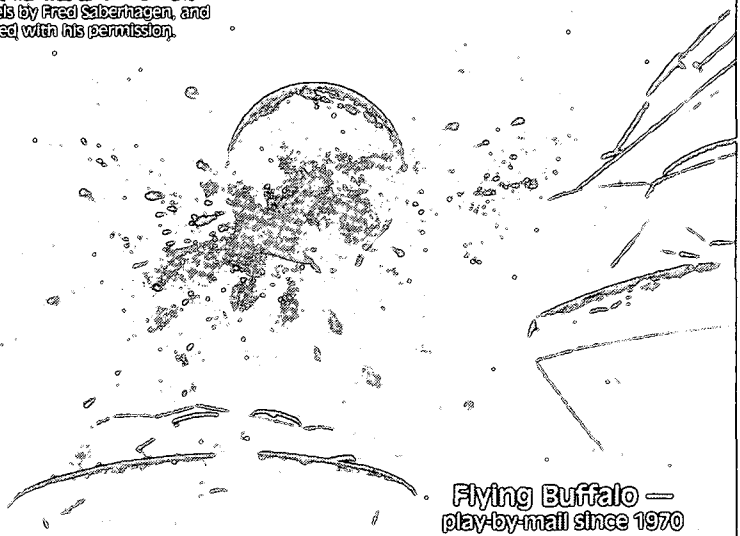

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for it turned with the sky and was clearly part of it. (Don't bother looking for it if you live in the city. Between the city lights and the dusty atmosphere, you'll never see it.)

The ancient Egyptians, who depended on the Nile for their existence, imagined the foggy band to be a heavenly Nile that fed the gods. The ancient Greeks thought it was a jet of milk issuing from the breast of Hera, when she was suckling an infant-god.

Such notions were fair enough. The foggy band did have a faint milkiness to it, and the Greeks called it the Milky Circle. Naturally, they did so in Greek, so that to them it was "galaxias kyklos."

The Romans referred to it similarly (but in Latin, of course) as "via lactea," which means Milky Way; and we adopted the Roman name in translation.

The ancient Greek philosophers sought to give the Milky Way a non-mythological explanation. Some thought it was the raw material out of which the stars were made and represented a supply that was left over. Some thought it marked an ancient path of the Sun. Some suggested the Milky Way was of the same substance as comets (which was reasonable, since both Milky Way and comets seemed to be composed of foggy luminousness).

It was left to the philosopher Democritus to advance the most incredible explanation. About 420 B.C. he suggested that the Milky Way was actually made up of a vast crowd of stars so faint as to be individually indivisible. But then, Democritus had all sorts of weird notions. He also thought that all matter was made up of tiny atoms that were also individually indivisible, so you can well imagine that no one paid much attention to *him*.

But then, twenty centuries later, Galileo pointed his telescope at the Milky Way and found out (son of a gun!) that it was made up of a vast crowd of stars so faint as to be individually indivisible. (Democritus turned out to be right about the atoms, too.)

It was still possible to think of the Milky Way as a band of faint stars lying outside the bright stars scattered evenly over the sky and not really part of them—but this notion was put to rest by William Herschel in 1785. He counted the stars in statistically chosen small portions of the sky through his excellent telescope and found that the number in each small portion rose steadily as he approached the Milky Way.

He concluded that the stars were not spread uniformly through infinite space, nor through finite space with the Milky Way encircling them. He held that they formed a finite conglomeration of definite shape—that of a grindstone (or a thick poker-chip, for those

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of you who have never seen a grindstone). He thought we were near the center of the grindstone, and that when we looked in the direction of the long diameter we saw so many stars that were so distant they melted into the Milky Way—which was thus itself part of the conglomeration.

The conglomeration was called the "galaxy," from the Greek phrase for the Milky Way. That gave us two expressions, both referring to milk: "Milky Way," a direct translation from the Latin, referred to the visible band in the sky. "Galaxy," from the Greek for "Milky Way," meant the conglomeration of stars that included that band in the sky and all the other stars visible in the sky as well.

For a century, astronomers assumed that the Galaxy included all the stars there were, even though as early as 1755, the German philosopher Immanuel Kant suspected that certain small foggy objects seen here and there in the skies were "island universes," each a very distant collection of very large numbers of stars.

All such small foggy objects were called "nebulae," the Latin word for "clouds"—which was, after all, what they appeared to be. The assumption was that they were patches of dust and vapor, as ordinary atmospheric clouds were.

There is an oval foggy patch in the constellation of Andromeda, for instance, which came to be called the "Andromeda Nebula;" an irregular one in the sword of Orion, the "Orion Nebula;" and another irregular one in Taurus, called the "Crab Nebula."

In 1796, when the French astronomer Pierre Simon de Laplace suggested that the Solar system developed out of a swirling mass of dust and vapor, he cited the Andromeda Nebula as something that looked like a developing planetary system, which is why his suggestion has always been known as the "nebular hypothesis."

The Irish astronomer, William Parson, Earl of Rosse, made a systematic study of those nebulae with a quixotically large telescope he built on his Irish estate (the phenomenally bad weather of which kept it from being used much). It was he who gave the Crab Nebula its name, and in 1845 he detected a nebula which had a distinctly spiral shape so that it came to be called the "Whirlpool Nebula." Within five years, fifteen such spirals were detected; and a class of objects called "spiral nebulae" was recognized.

Were all these nebulae part of the Galaxy? Most astronomers thought so. In 1918 the American astronomer, Harlow Shapley, showed that the Galaxy was much larger than had been thought in the 19th century and that the Solar system was far off-center within

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it. The Galaxy was, in fact, 100,000 light-years across (and Shapley first thought it was even larger than that); and that made it seem more likely than ever that that was all there was.

Another American astronomer, Heber Doust Curtis, gathered evidence that upheld a contrary view. There were a surprisingly large number of novae (or brightening stars) in the direction of the Andromeda nebula, and that could not possibly be unless the Andromeda nebula were itself a vast collection of stars as Kant had once suspected.

There was a great debate between Shapley and Curtis in 1920, and Curtis won. At least, after the debate there was a steady shift to Curtis's side of the argument. Some nebulae, like the Crab Nebula and the Orion Nebula, were established as "galactic nebulae;" that is, clouds of dust and gas that were definitely part of the Galaxy. Others, however, like the Andromeda Nebula and the Whirlpool Nebula, lay far outside. A new class of nebulae was recognized: the "extra-galactic nebulae."

Galactic nebulae were luminous when they contained stars within them. Extragalactic nebulae were luminous because they contained many stars, very many. It took very many stars to give them detectable luminosity at their enormous distances. In fact, they had to be galaxies like our own. Slowly and rather reluctantly, people began to speak of the "Andromeda Galaxy" and the "Whirlpool Galaxy."

Our Galaxy is simply one of many. So what do we call this galaxy we live in? I'll consider that next issue.

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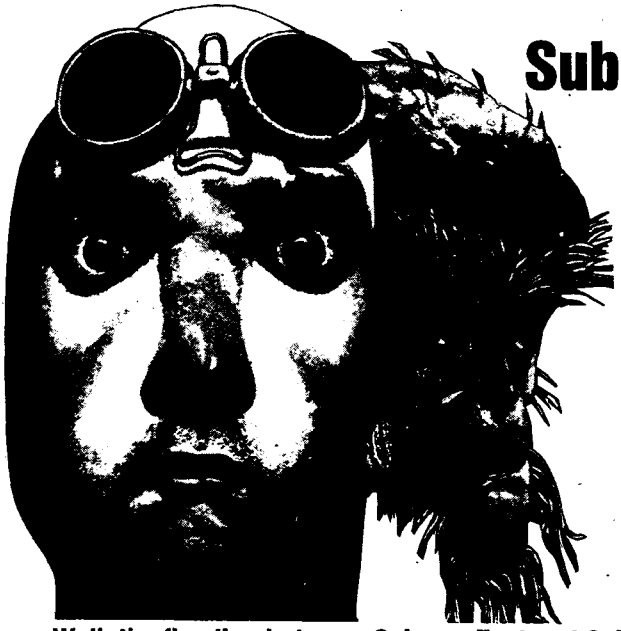

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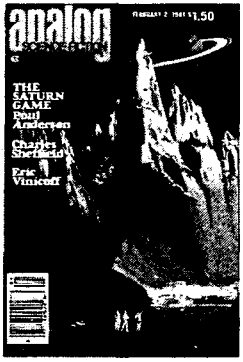

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As I've noted before, I generally avoid talking about sequels or spinoffs. And while I believe that "rules are made to be broken" is maybe the most pernicious maxim known to man, I'll invoke it here with the added excuse that we might just have to hand a classic in progress; and in a case such as this, it is both a joy to read and a pleasure to report on each segment as it appears.

Readers who remember my delighted babbling over Gene Wolfe's *The Shadow of the Torturer* may guess correctly that this current fit of the babbles is over Part Two of the tetralogy of which *Torturer* is Part One. (The whole thing bears the general title of *The Book of the New Sun.*) The second installment, *The Claw of the Conciliator*, is as superb an achievement as the first, I'm happy to report, with the exception of one slight problem I'll go into later.

For those unfortunates who have not read the opening segment (not yet in paperback as I write, but if ever anything was worth owning in hardcover . . .), let me note that it takes place in an immeasurably far future on Urth, after humanity has been to the stars and, for the most part, retreated from them, but not without im-

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porting many strange and exotic things—customs, beings, skills, influences.

Through the overwrought landscape of this strange Urth, we follow Severian of the Guild of the Seekers for Truth and Penitance (otherwise known as the Torturers) as he makes his way toward a new position in the far city of Thrax. Volume one barely got us to the walls of Nessus, the huge metropolis that is the capital of Urth and which contains the headquarters of the Guild.

The second volume takes us out into the countryside, as strange and unexpected in its way as was the huge city. Severian becomes involved with the rebel, Vodalus, who is determined to bring back the wisdom of ancient Urth, and spends an eventful period at the House Absolute, the enormously convoluted and mostly invisible palace of the Autarch. The strange artifact known as the Claw of the Conciliator, which Severian has acquired more or less by accident, acts at times as an erratic *deus ex machina.*

As you may gather, the *mise en scène* is enormously complex, the writing stylish and elaborate, the ideas and concepts startlingly original and seemingly inexhaustible. As an example of the last, I was a bit baffled at coming across the sentence, "The western horizon had already climbed more than half up the sky." Much later, when I hit another throwaway line—" . . . and when the eastern horizon had dropped below the sun . . . "—I realized just what a new, but perfectly accurate, vision of dawn and daylight Wolfe was giving us.

I was only slightly annoyed at *The Claw of the Conciliator* at one point, where the narrative is broken off to give the full text and stage action of a play presented at the House Absolute; and at another, where we are given one of the legends of this time. Both vibrate with curious references to legends and religions of our own period, and are marginally interesting, but I was put off by them simply because I was so enrapt with the basic story. (I can think of only one place where an author pulls off describing a performance of a play, blow-by-blow, and that's the fertility rite sequence in Robert Graves's wonderful—and only—science fiction novel, *Watch the North Wind Rise.*)

As I noted in my review of the first volume, the playful elegance, elaborate ornamentation, and ceaseless invention of Wolfe's writing can only be described as Baroque; in fact, this new section even goes a step beyond, into what must be characterized as High Baroque. If the next two volumes fulfill the promise of the first two, Gene Wolfe will have written one of the best science fiction epics of all time. And I will overcome my aversion to "rules are made to be

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broken" and review them, too.

(A warning to the unwary reader. Do not, repeat, **do not** read *Claw* without reading *Shadow*. It will make no sense to you; even a six-month gap made a bit of a problem for me. The best thing, judging by these two, is to wait for all four before beginning, but that, of course, requires the forebearance of a saint.)

I'm pleased to note that other authors are also working in that area which I choose to think of, rather whimsically, as Baroque. Combining the rational wonder of SF for verismo with the extravagance of the best fantasy, its possibilities are boundless. The latest in the list is Janet Morris, with *Dream Dancer*, a tale of a future which the author pinpoints for us as a mere three hundred years away. Earth is a jerkwater planet, mostly inhabited by relatively primitive types, who succeed in killing two of the three "enchanters," human star travelers who are, in a sense, slumming.

The one survivor takes with him a young female native who had helped him escape. The universe she is thrust into is a decadent, but fascinating one. Hyperspace is regarded as, and called, "sponge," with myriad twisting, intertwining holes in the fabric of space. And Morris even manages to turn normal space askew for the reader; planets are merely "anchors" to swing totally man-made worlds about. These worlds are called "platforms," a slightly misleading term, since they are many-levelled artificial environments, the principal one of which, Lorelie, takes the place here of the great, many-roomed house which seems almost *de rigeur* to the Baroque (the House Absolute, Gormenghast, Gloriana's palace, etc.).

Be that as it may, Morris has created a universe in which the physical realities of place and movement are quite different from what we've accepted *as* reality (much of it, admittedly, from the conventions of SF), no mean feat. The characters and culture of this universe are also also inventive and original; it is ruled by great families who manage what are really combinations of commercial empires and feudal estates. The story itself is classically Horatio Alger, reminding me not a little of Heinlein's wonderful *Citizen of the Galaxy* in a feminine mode. The adolescent girl from Earth, by pluck, luck, and a helluva lot of innate talent, rises from scullery maid and part-time prostitute to wife of the Consul.

Part of this fascinating progression is spent as a dream dancer, an illegal occupation which is a sort of telepathic one-person theater, the only fiction that exists in this information-ridden culture.

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There are many other nice touches (I was particularly taken with the symbiotic relationship between the human pilots and their sentient ships); unfortunately, *Dream Dancer* suffers in comparison to the Wolfe work. There isn't much that wouldn't, in fact; but this is on some very specific levels. One of these is the matter of complexity and simplicity. Despite the ornamentation of the narrative, Wolfe's story is a simple one, and even the complex concepts he is giving the reader shape up neatly. Morris is still a complicated writer, and there were times when I simply lost track of what she was telling me.

And there is also the matter of words. Both writers like to use esoteric and obscure words (Wolfe's: *spadroon, fuligin*, and my favorite, *epopt*, among others; Morris's: *chalybeate, gerontic*, and *Archaememid*; you look 'em up—I'm not going to do *all* your work). Wolfe's succeed—they seem instinctively right, while at times Morris's sound like she's showing off. And while *teal* is one of my favorite obscure colors, every other thing in her Consortium seems to be of that hue; too much of a good thing.

But it's just Morris's bad luck that *Dream Dancer* came out neck-and-neck with Wolfe's novel. She's written an engrossing and individually styled book, and I look forward to the even better works its potential implies.

There's a new fantasy out to which Baroque might be the last term implied. It's rather spare and relatively unsophisticated, and I found it captivating. While it's yet another spin-off from the Arthurian canon, it takes an original tack by dealing with Guinevere's life before her marriage to Arthur. It's called, simply enough, *Guinevere*; and it's written by Sharan Newman.

Guinevere is the daughter of Leodegrance, whose family is one of the few remaining Romanized in a Britain abandoned by Rome to the marauding Saxons. They hear tales of a new British war leader named Arthur, who may bring the hope of reuniting Britain and restoring civilization.

When Arthur and his captains come to summer on Leodegrance's estate, Guinevere is sent to the deep forest to stay with a Christian couple who live a secluded, simple life in the deep forest. There she meets a unicorn, and begins a mystical love affair that will surely die if the seemingly inevitable union with Arthur takes place.

This is not so wispy and romantical as it sounds—there are some exciting battle/strategy episodes against the Saxons; and the background of post-Roman Britain is presented fairly realistically,

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though not quite so brutally as some I've read. Perhaps what made the novel for me was its humor, embodied principally in the person of St. Geraldus. Poor Geraldus has long given up the battle against sainthood, the only qualification for which (besides a certain unworldliness) is the almost consistent hearing of an invisible choir, mostly out of tune and apparently totally unlettered in music. Geraldus's struggles between the "real" world and his unmanageable singers is hilarious, and an inspired addition to the story.

This is fantasy neither epic nor meaningful (though I must admit the depiction of civilized life with the barbarians at the gates read a little too close to home for comfort), but I read it with more pleasure than a good many weightier novels I've had to cope with.

Alas, this applies to Brian Aldiss's new *An Island Called Moreau*. Aldiss is a major figure in what might be called the current middle-generation of SF writers, and usually ahead of his peers in intelligent experimentation. Lately he has developed a Farmeresque tendency to play with the basic stuff of SF which has become legend (*Frankenstein Unbound*). I think my problem with this one is that I'm not quite sure why Aldiss wrote it. When I said "play with," I wasn't implying having fun with—*An Island Called Moreau* is far from funny. It is basically a retelling of the H.G. Wells story, taking place on the very same island in the near future, and substituting genetic manipulation for surgical manipulation. The Moreau figure is a thalidomide baby grown to misanthropic manhood who (ah, the irony of it all) is subsidized by the U.S. to experiment on the bestial descendants of Moreau's victims.

There is a major nuclear war in the offing—sort of an out-of-hand brush fire that hasn't quite gotten to the powder magazines; and the story is told by a U.S. diplomat, shipwrecked—more accurately, shuttlewrecked, since he's coming back from the Moon—on the island. Perhaps Aldiss is warning us about genetic manipulation; but it's a little hard to say where his sympathies lie, since we're given no heroes; in fact, just the opposite. A more unlikable collection of characters I've seldom run into, from the stuffy diplomat through the Thalidomide Kid down to the raunchy Beast People. (One exception—the Dog Person, inevitably, may be the only nice being in the book; his name is Bernie.) I'm not saying that one must always have a noble hero to empathize with, but one way or another, the reader must care for what happens to the characters, and I felt no stirring of such in this case.

It's done with the intelligence and craft one has come to expect

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from Aldiss, certainly; but here I think he should have left Wells enough alone.

The academic, bibliographic crowd has been rather neglected here for a while; let me remedy that by noting some heavyweight but valuable tomes recently published by G.K. Hall. They are exhaustive bibliographies devoted to the works of Delany, Sturgeon, Zelazny, and Norton. (If I gave titles and authors here, it would fill the rest of the column. Check the column's opening list for details.)

They each include a detailed biography, categorized bibliographies that seem to include everything the subject has written up to and including his/her grocery lists, listings of reviews of the subject's works, and indices.

When I say exhaustive, I mean exhaustive, by the way. I found several reviews of mine listed that had been published in journals that, shall we say, had not achieved exactly wide distribution. All four volumes are remarkable pieces of work.

And finally, as usual, notices of publications by those connected with this periodical (what a fecund lot we are!): *Isaac Asimov Presents the Great SF Stories: Vol. 5 (1943)* and *Isaac Asimov's Worlds of Science Fiction*, edited by George Scithers.

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THE PORTRAIT OF BARON NEGAY

by Barry B. Longyear

art: Alex Schomburg

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In the few years since his first story appeared (in our December 1978 issue), Mr. Longyear has proven to be as popular with his colleagues and his readers as he has with editors. He is presently at work on a long novel involving the planet Momus.

When the fabric of the United Quadrants of the Milky Way Galaxy tore under the weight of its own corruption, resulting in the period called Darktime (2661–2940 GS), the interruption of trade and the devastating consequences of constant warfare isolated all but a few of the Galaxy's human-populated planets. Among the many planets that suffered severe damage and loss, and were then left in rubble and barbarism to fend for themselves, was the agricultural world of Demeter. When the fighting moved to other quadrants, the remaining population on Demeter banded together to form the small self-defense organizations that evolved to become the oppressive feudal baronies that epitomized the beginning of Demeter's third century of Darktime.
—Andurant, Demeter and Darktime, *(Republic Press, 3230 GS)*

Tomasi the forger stood in his resplendent maroon satins and watched as the wealthy young Baron Negay traversed the polished marble floor of the audience chamber examining the painting on the easel. Next to the baron's gaudy throne stood a yellow-robed old man with white whiskers and balding head. The baron placed his gem-encrusted left hand against his hip, leaned back, and scratched his nose with his right forefinger. He raised his left eyebrow and looked at Tomasi. "And you ask forty thousand for a single-layered work?"

Tomasi shrugged. "It is a genuine Sabro, Excellency. A great find. Forty thousand hardly covers my expenses in bringing it from New London which must come from my commission—"

Negay waved his hand. "Yes, yes." The baron looked back at the semi-abstract crowded with images of human and almost-human hands. "The price is satisfactory—provided that the painting is genuine." The baron looked again at the forger. "We are quite knowledgeable about art in my barony. And quite harsh on forgers."

Tomasi lifted his left hand and placed it gently upon the frame of the painting. "I assure you, Excellency. This is a Sabro—"

"We take the fingers off of forgers, Tomasi." He grinned around

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the horrors he used for words. "Then we burn them, using the ashes to make my fields more fertile."

Tomasi held out his hands. "As well you should, Excellency."

The baron turned to his right and nodded at the old man, then returned his glance to Tomasi. The old man pulled a coder from his pale yellow robe and moved to the painting. "Old Peter will examine the work. He is our resident expert."

Tomasi met the old man's glance, then held out his left hand toward the painting. "The great Sabro and I have nothing to hide."

Old Peter reached out his right hand and touched the paint. Tomasi recognized expert fingers feeling the texture and dryness of the work's surface. The forger's expression was one of genuine unconcern. *I am an expert, too, old man.* The forger smiled as Peter turned and faced Baron Negay. "The composition, style, technique, period, and medium appear to be Sabro's, as do the choices of canvas and frame." He looked back at the painting and lifted his coder. He drew the small red box across the face of the painting, read the numbers that appeared in the coder's tiny screen, then replaced the box in his robe. Tomasi frowned as he saw the same hand withdraw a pocket art register. *These fools have already been burned.*

The old man flipped through the pages of the register, then stopped. He studied the small book, then turned to the Baron. "Excellency, the work may be genuine. The magnetic code number matches that of Sabro's missing work entitled 'Hands'." He turned toward Tomasi. "However, this work is recorded as having been destroyed in the Yorkton fire. This piece may be a forgery—an excellent forgery—but still a forgery."

Tomasi smiled. "My dear Peter, the great artist himself was killed in that fire. The register only shows works that had been registered as sold prior to Sabro's death, along with the few that have been turned up since in the Western Colonies. Two such paintings I had the honor to represent to Queen Loren's court myself. Both fine Sabros, and both authenticated by Mersiat and Steben of Her Majesty's service." Tomasi again placed his hand on the frame. "I assure you that this painting is as genuine as the others that have been authenticated since the fire." Tomasi nodded. *I know; I forged those, too.*

Baron Negay frowned at the old man. "Peter, how long will it take for you to be certain? I need no forgeries at my sister's birthday festival. At this moment much depends upon Elena's good graces, and I can tolerate nothing that would put me in a bad light with her."

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"Your Excellency, I must do an analysis of the paint's composition, then research the many photographs that Sabro took in his studio. There are several of the artist's missing works recorded there." Peter frowned and scratched his beard. "That, and I must study all of the artist's work on hands. As I recall, Sabro was never much taken to hands as a subject."

Tomasi issued a polite chuckle. "Then, Peter, why did he paint a work entitled 'Hands'?"

Peter looked at Tomasi. "Many times Sabro used symbolic titles." He looked at Baron Negay. "It will take me three to four days, Excellency."

Negay nodded. "Then be off. Elena's birthday celebration is in four days."

Shortly after the old man picked up the painting and left the room, two armed and helmeted guards entered. Tomasi raised his arm, glanced at his timepiece, then held out his hands. "Excellency, I had not planned on imposing on your hospitality for such a time. I must return to New London and catch my flight if I am to keep my other appointments."

The baron turned his back and motioned toward a hallway. "Come with me, Tomasi."

The forger remained standing. "Please, your Excellency. I must insist." Tomasi heard the two guards approaching. *Negay's argument gathers strength.* He shrugged, stepped off and followed the baron through a stone arch into a gallery lined with the blinking and flashing screens of mind-paintings. Negay held out a hand toward one of the screens.

"What do you think of it, Tomasi?"

The forger fought to keep his lip from curling into a sneer. *Snapshots; electronic garbage.* He studied the screen. The image was formed and altered by the constant repetition of two shapes, each trace of the first shape, an inverted "L," changing the screen from blue to red, while the second shape, a reclining "L," changed the screen from red to blue. *Mindless computer graphics.* Tomasi shook his head, then faced Negay. "Excellency, I fear that I can offer no opinions on works in this medium. Mind-painting is not my area of expertise."

"You are quite a snob, for a commoner, Tomasi." Baron Negay cackled and moved on to the next screen. Tomasi followed, half-surprised at the degree of cruelty evident in the young baron's laughter. The baron lifted his hand again. "Here, Tomasi. What do you think of this one?"

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The forger glanced at the screen. The image was a summer landscape, serfs toiling in the fields. Particle by particle the image changed to colored trees, browning grass, and countless serfs engaged in the baron's harvest. Winter came, and the serfs cut wood for the baron's mansion. "For a mind-painting, Excellency, it seems adequate."

"This was done by Balum, our court artist. Have you heard of him?"

"No, Excellency."

"Balum came to the art from a family of serfs back when my father was alive." Negay studied the ever-changing image, half-talking to himself. "Frightening to think that those pieces of meat in the fields might have thoughts of their own." He motioned toward the forger. "Come." Tomasi followed the baron down the hallway, noticing as he glanced to his left that the two guards followed them. The baron stopped before a one-layered painting on canvas. "A bit old-fashioned, but this one may be more to your liking."

The forger stopped at the baron's side, took one look at the knife-painting, then felt faint. It was the most awkward forgery of an Xavier he had ever seen. *Jarouls the forger—his work.* Tomasi brought his face close to the canvas, then turned and faced Negay. "I . . . am terribly sorry, your Excellency. This is an obvious forgery."

Baron Negay nodded. "Yes. A forgery for which I spent much money. Money that my tax collectors worked long hours suffering much abuse to collect."

Tomasi found that a lump blocked his throat. "How did your Excellency discover the forgery? It is . . . very well done."

The baron's eyes narrowed. "Do not patronize me, Tomasi. My hide is not as thin as you might think; nor my mind as dull."

"Your Excellency, I never—"

"After purchasing this, it was put on display in the village for the serfs to help them keep their lazy minds off of their fat bellies. One of the first ones to see it—a woman named Voya—saw that it was a forgery. Quite a surprise, a serf with a knowledge of Xavier. She did me a great service." Negay glanced out of the corner of his eye at Tomasi. "You can imagine what my embarrassment would have been if the display had continued. After that experience, I hired the services of Peter. It is never wise to give the servant reason to laugh behind his master's back."

The forger nodded and pursed his lips. *Serfs never laugh, Negay.* "The woman is dead, of course."

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"Of course." Negay motioned for the guards to approach. "Dead as well are the eight or ten other serfs who also saw this painting."

The forger frowned as he felt strong hands grip his upper arms. "But, Excellency—"

"Tomasi, if your Sabro is genuine, you will have my sincerest apologies for your detainment; if it is a forgery, I shall find the slowest, most painful punishment that exists for your lesson." Negay looked down and touched a finger to his lips. He then looked up at the guards, pointing the finger at the forger. "Yes. Put him in the cell with Balum. The old fool will never finish my portrait unless he receives some assistance." He looked at the forger. "I have Balum preparing my portrait in the old-fashioned style as a present for my sister. If he should finish my portrait in time for my sister's party, I shall set you free—forger or not. It is that important to me." Negay turned abruptly and continued down the hallway.

"Your Excellency—"

Tomasi felt a jerk on his arm; he was turned around and aimed at the arch. The deep voice of the guard on his left rumbled, "Come along."

The forger's feet hardly touched the floorstones as he was whisked through the audience chamber into the mansion's flag-decked grand hall and from there to a door behind a cut-and-polished stone double staircase. As he was dragged through the doorway, the three entered an elevator car. The door closed and Tomasi felt his stomach lift as the car began its descent. The car hissed to a halt and the doors opened, revealing a gray, split-stone hall lined with harsh lights and solid metal doors. Two leather-clad brutes in the hallway pushed themselves up from a table and approached the door of the car. Tomasi heard the screams of someone pained beyond reason.

The guard holding the forger's left arm laughed and addressed one of the dungeon keepers. "Gunder, your man with the hot irons is in good form today."

The keeper called Gunder grinned through missing teeth and examined Tomasi. "My, isn't this a pretty one?" He looked over at the guard. "And, Kile, what would Negay have me do with this ornament?"

The guard laughed again. "Don't spoil him until you get orders from the baron, Gunder. He is to be put in with Balum."

The guards shoved Tomasi into the hallway, causing the forger to fall to the hard floor. Gunder grumped and nudged Tomasi's ribs with the tip of his boot. "Another addition to our art department."

Kile snorted out something between a laugh and a sneeze. "You'll

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get your tongs on Balum soon enough, Gunder."

The keeper grunted. "The old fool wants the mind-painting equipment from his apartments brought down. See to it, will you?"

"Right away." The elevator doors closed.

Tomasi's stomach squirmed at the familiar smells of sweat, pain, blood, and fear. Another person's screams joined the first. Tomasi felt strong hands grip his upper arms. The guards pulled the forger to his feet, then began pushing him toward a closed cell door. The barrel-chested one on Tomasi's left looked over the forger's clothing. "Bah! Gunder, why do the well-dressed ones come in such small sizes?"

The other guard chuckled. "I think the baron prefers that those our size be friends rather than enemies." The unknown prisoner continued screaming as the guards roared out their laughter.

They stopped before the cell door and the guard on the right removed a lockbox from his waist and held it against a white plate set into the surface of the door. The door opened and the guards shoved Tomasi through it. Again the forger went to the floor. A voice boomed out over him. "Balum!" The forger turned to his left

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and looked up from the stone floor to see the back of a huge easel and canvas. "Balum!"

"Eh?" An old, shaggy-headed man peeked around the edge of the canvas with half-closed, red-rimmed eyes. "What do you want, Gunder? I am busy and must not be disturbed."

"We have a helper for you."

The old man snorted, then disappeared behind the canvas. "Remove him. I need no help."

"The baron ordered it, Balum. He has doubts that you will finish his portrait in time for Lady Elena's birthday party." The guard laughed again as he slammed shut the door.

Tomasi pushed himself to his feet and brushed off his satins. He looked with disgust at the small tear in his right slipper. Muttering, the forger looked around the dark cell. Two raised platforms covered with thin mattresses and single sheets served as beds while a sink and toilet against the far wall met sanitary needs. The only light came from behind the canvas. Below the naked light bar Tomasi noticed a light array for reading multi-layered paintings. He walked toward the canvas, moved around it to his left, and stopped at a table littered with tubes, mixers, brushes, scribers, solvents, pallet papers, and other implements of the painter's trade. On the other side of the table, squatting in a paint-spattered longshirt upon a low stool, the one called Balum stared in disgust at the canvas. Tomasi looked at the face of the canvas and frowned. "What is it?"

Balum quickly turned his head to his right, then pointed at Tomasi. "Get away from me! If the baron insists on you being here, I cannot stop you. But keep away from me!"

Tomasi raised his eyebrows and pointed his thumb at the canvas. "What is it?"

Balum leaned his right elbow on his knee and rubbed his eyes. "It is a foot."

The forger laughed. "A *foot?*" He shook his head. "Off of what kind of creature came that foot?"

Balum lowered his hand, then reached to the table and picked up a pallet knife. He paused, then began scraping the paint from the canvas. As he finished, he wiped the knife clean with a piece of paper, then threw the paper to the floor atop a pile of similar papers. The canvas had been scraped many times. Balum looked at the forger. "It is not quite right."

"I noticed." Tomasi sneered. "Mind-painters, bah!" He waved a hand at the canvas. "Why does the baron have a mind-painter attempting art?"

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"Art?" Balum stood, his face reddening. "I *am* an artist!" He waved a hand at the forger. "Who are you to judge art?"

The forger bowed. "Tomasi, dealer in fine art; mind-painters, fools, cripples, and children need not apply."

Balum nodded and turned back to face his canvas. "I hope you are as successful as our most recent forger—"

"I am a dealer in art; not a forger!"

"—but with Peter sniffing around, I doubt it." Balum looked at Tomasi. "Have you ever seen a hand without fingers?" He shook his head. "Quite unartistic."

"I am no forger!"

Balum snorted. "Of course." He pointed toward the bed platforms. "Now if you will be so kind, dealer in fine art, I have work to do."

Tomasi folded his arms. "Look, you old fool, I can help. I am supposed to help."

"I need no help."

"If that is the best you can do for a foot, Balum, you need help!" Balum lifted a large brush and began whiting out the canvas. "I deal in art and know quite a lot about it." Tomasi swallowed and looked around the room. "I have also done some brushwork of my own—certainly better work than that foot. You should have remained with your mind-mush; better still, in the fields grubbing potatoes."

Balum turned his head and lowered his brows. "Forger, my art took me *out* of the fields!"

"Potato digger." Tomasi glowered, then looked among the items littered upon the table. He saw the paints and reading lights for multi-layered paintings. *Surely there must be a coder.* He found a roll of magnetic stripping, another larger roll of gel. Between them was the red case of a coder. He reached out, picked it up, turned it on and began walking around the cell. Several times he paused, saying "Da, da, da."

"What are you doing?"

After sweeping the entire cell with the coder, Tomasi returned to Balum's side and dropped the red box on the table. "A coder makes an effective detector of listening devices. The cell appears clean."

Balum finished whiting out the canvas. "I suppose you learned *that* in art school, too, eh forger?"

Tomasi reached over the table, grabbed the cloth of Balum's long-shirt beneath the old man's beard, and spoke in a harsh whisper as he pulled the mind-painter off of his stool. "Hear me, you old fraud. I will not let my life depend upon you and your pitiful skills. I will

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do the portrait. All you must do is to claim it as your own. Then we will both be out of the soup."

Balum's face remained impassive. "No."

Tomasi relaxed his grip, letting Balum sink to the stool. "No? It is the perfect solution—"

"Is this *more* that you learned in your school of art, Tomasi? Taking credit for another's work?" Balum turned back to the canvas. "I am an artist, forger. If this portrait is to be under *my* name, *I* will be the one who will do it." Tomasi began moving around the table. Balum spoke without turning around. "And if you force me to let you do it, I will deny that it is my work."

The forger stopped and stared at the old man's back, then shook his head. "If you fail to produce a portrait in time, what then?"

Balum lifted a brush and made a timid spot of yellow on the expanse of white. "I will be burned." The old man's voice faltered. "I . . . I do not want to end tied to a stake, Tomasi. Leave me to my work."

The forger shook his head, and held out a hand toward the canvas. "How long have you been at this, old fraud?"

Balum was silent for a long moment. "Twenty-eight days." He turned around on the stool and faced the forger. "I am a mind-painter—an artist that paints on screens directly with thoughts." He pointed the brush at the canvas. "It takes time to learn how to force those thoughts through fingers." Balum again faced the canvas. "But I *will* do it, because I *am* an artist."

"Bah!" Tomasi pushed the old man from his stool and stood before the easel. "Watch this, you ancient fake." The forger picked up the pallet knife and scraped the white and yellow paint from the canvas. Balum struggled to his feet.

"Don't! I need the background—"

Tomasi slapped the paint-covered blade of the knife into Balum's hand. "Feel that paint, *artist*. It dries very slowly, and if you attempt to place other colors on top of it before it dries, the colors will smear."

Balum wiped the paint from his hand onto the front of his long-shirt. "I knew that."

Tomasi squirted a length of black from a new tube onto a pallet sheet. He selected a brush and tested the paint for thickness. "Then, Balum, you of course know the medium you selected takes at least six days to dry sufficiently to add more paint." The forger glanced at the mind-painter, then brought the brush to the top of the canvas. "You don't have six days, Balum." With a single, swift stroke, the forger bisected the canvas vertically with an even, straight line. He

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again touched the brush to the pallet, then bisected the canvas horizontally, dividing it into four equal segments. Tomasi threw the brush to the table, opened four tubes of paint and squirted lengths of red, blue, yellow, and white onto the pallet. Selecting several brushes, he faced the canvas, thought for a moment, then began painting the upper left quadrant with bold strokes.

Balum stared as the quadrant rapidly filled with the face, right shoulder and upraised right arm of a military figure. "Tomasi, what . . . what are you doing?"

Tomasi moved to the lower left quadrant and continued. "You are correct, mind-painter. Putting your thoughts through your fingers takes time to learn." The lower left quadrant filled as rapidly as the first, continuing with the same military figure, but in a radically different style and color arrangement. Tomasi stood, threw his brushes to the table, and picked up the pallet knife. He looked at Balum. "Old fool, it takes *years!*" He mixed and scooped color from the pallet with the knife, and using the knife, the figure was continued in the upper right quadrant—the same form, but done with heavy sweeps, slashes, and moldings of color.

"Fraud, I began my schooling in art when I was six years old—my sole study for twenty years." He completed the knife-painting, threw both knife and pallet to the table, then picked up an array of color-banded, black scribers. He stooped and began filling in a background in the lower right quadrant with the scribers. He completed the background, retrieved the roll of gel, and placed the roll against the canvas, trimming the sheet to fit. Again with the scribers, he continued with the background. Layer upon layer, the quadrant filled with a continuation of the same military figure, but with such depth of color and perspective that it seemed real.

Tomasi stood and faced Balum. "I spent another ten years on my own trying to make a living with my work." He tossed the scribers onto the table, then poked Balum with his right forefinger. "I was not good enough, *artist!*" He lifted his hand and held up his little finger. "And there is more art in *that* than you contain in your entire carcass!" The forger stared down the mind-painter, turned, walked to one of the bed platforms, and dropped onto it. He shouted at the easel, "When you want my help, ask." Tomasi interlaced his fingers, put them behind his head, and stared at the dark ceiling. Sounds of movement came from behind the easel, then silence.

"Tomasi." The forger rolled over on his right side, his back toward the easel. "Tomasi."

"What?"

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"Your fingers are very skilled. I envy you that skill. But your fingers contain no art."

"Mind-painting as a court toady, Balum, is swampy ground from which to make such judgments."

"Tomasi, I see the feeling and style of Pordaan here, Cordalayne down here, Xavier and his knife up here, and the layered magic of Mahdina down here. Even the subject—I recognize it—the general Manet on the fields of Preyas as painted by the great Thoam."

Tomasi snorted. "At least you recognize some of your betters."

"Yes, I recognize them." Balum remained silent for a moment. "Where are *you* in this painting, forger? You have borrowed everything—even the subject. You are an excellent copier; forger. But you have no art."

Tomasi bit his lower lip, then turned his head toward the easel. "I do not claim to be an artist, Balum. But if I am not, what are you? What chance have you to save your skin? You don't even know where to start." He turned back to the wall. The forger listened to the silence for a long time until it was broken by the scraping of a pallet knife upon canvas. The scraping stopped.

"As little as you think of mind-painting, Tomasi, it is art. It is art because *I* am in every piece that I do. At this moment I would give my fortune for your fingers. Perhaps I will not be able to complete the portrait in time; but if I do, it will be *mine.*"

The forger stared at the wall. "You are a fool, Balum."

"Perhaps."

Tomasi closed his eyes and drifted off to sleep to the sounds of scraping.

The forger awakened with a start as the cell door slammed open. He sat up, swung his feet to the floor, and rubbed his eyes. Gunder, the keeper, handed two metal trays to Tomasi while the other keeper moved several large wooden crates inside the door. Gunder faced the back of the easel. "Here is your mind-painting gadgetry, Balum."

The old man's voice came from behind the canvas. "Leave it and go, Gunder."

Gunder stared at the easel, then he grinned. "Sooner or later, Balum, I'll have you in my fun room."

"Until then, go away."

Gunder shook his head and the two keepers left, slamming the cell door shut behind them.

"Balum, there is food." Tomasi looked at the two trays and wrinkled his nose at the food's odor. He shrugged. *At least nothing is*

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looking back. He lifted the trays, stood, and brought them to the sleeping platforms. "Balum." He placed the trays upon his bed, then walked to the easel. "Balum?" As the mind-painter came into view, Tomasi saw the old man bent forward, his arms on his knees, his head cradled in his arms. The forger looked up at the canvas, then shook his head. The arms were too short, hands and feet too small, the face as flat as if it had been hit with a skillet, the gaudy clothing without a stress or drape as though it had been borrowed from a paper doll.

Tomasi sighed and put his hands upon Balum's shoulders, pulling the mind-painter to a sitting position. Balum half-opened his eyes and weaved upon the stool. "It is done, Tomasi. See? It is done."

The forger nodded. "Ah, yes." He pulled Balum to his feet and led the old man toward the other sleeping platform. He seated the mind-painter on the bed and reached for one of the trays. When the forger looked back, Balum had lowered his head to the mattress and was fast asleep. Tomasi sighed, replaced the trays, and lifted Balum's legs onto the platform. He then took a few experimental bites of the dungeon's cuisine. After washing down the food with weak tea, the forger moved to the easel and sat down upon the stool.

He lifted the pallet knife, and in a few moments, the canvas was scraped clean. At the end of three hours, a highly complimentary portrait of the young Baron Negay looked down from the canvas. The image was garbed in Arine furs and purple-trimmed, shiny black leathers; an increase in rank and status that would stroke the little despot's ego. The baron's face had been configured into one of strength, virtue, and beauty. Perhaps no one but Negay would see himself in the portrait, but that Negay would see himself in it the forger had no doubt. He had done portraits before. Each wart removed increases the artist's reward.

He wiped his hands, tossed the rag onto the table, then went to his sleeping platform. As he turned to sit down, he noticed that Balum had not moved. "With luck, old fool, you will think that you painted it; and I shall declare myself wrong and praise you to the heavens." Tomasi snickered, placed the trays upon the floor, and stretched out.

The forger awakened with strong hands around his throat and Balum's reddened face screaming at him. "Fiend! You *devil!* You—"

Tomasi brought up a knee and thudded it into Balum's ribs. The old man dropped to the floor of the cell, writhing for his breath. "Balum, you . . . damned old—" Tomasi coughed, got up from the

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platform, then delivered a telling kick to the mind-painter's thigh. "—damned old fool! What were you trying to do?"

Balum, clutching his thigh, breathed deeply and rapidly. "You *corrupter!*" He pushed himself to his feet and stood facing the forger, his face contorted with rage. "Corrupter! Evil filth! Moral slime!"

Tomasi stared at the old mind-painter as Balum's face changed from rage to shame. "Balum, what is wrong?"

Balum's shoulders slumped, then he lowered himself gently to the forger's sleeping platform, his face covered with his hands. "When I awakened I knew . . . I *knew* the portrait I had done was poor. I *knew!*" The old man shook his head, then uncovered his tear-streaked face. "I went to the easel to salvage what I could . . . then—" He pointed a shaking finger at the forger. "—then *I saw what you did!* Your beautiful painting . . . your beautiful, false, phony portrait! Even stealing technique and style from the masters, you must use their truths to tell *lies!*"

Tomasi rubbed his throat and shrugged. "Negay would not approve of truth, old fool. At court today, you should know as much. Should I have shown the twisted, indulgent parasite that feeds off of the backs of a malnourished people? A torturer? Murderer? Thief? Should I—"

"Silence!" Balum wiped the wetness from his face with the backs of his hands. "It is not your lies, forger. It is that I have spent hours on that stool, staring at that painting, trying to convince myself that I should do as you said and take credit for it."

Tomasi sighed and held out his hands. "Do not our skins have value? I am not a corrupter, Balum; I am a survivor. Let this one lie pass and you will remain alive to exercise your toady's integrity upon your mindless mind-paintings—"

Balum stood and walked to the easel. "Stay away from here, forger."

Tomasi sat on the edge of his platform and looked at his timepiece. He looked back at the easel. "You have less than three days remaining, Balum."

"Forger, touch this canvas one more time and I will kill you."

Tomasi sighed as he heard the sound of scraping.

Hours later, after napping, eating, washing his face, and listening to the constant discomforting muffled screams coming through the cell door, the forger had exhausted his environment's entertainment potential. During those hours, he heard the paint being scraped from the canvas six times. He paced for awhile, then climbed to his sleep-

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ing platform in the dark end of the cell and sat with his back against the cold wall, his feet upon the edge of the bed. As he rested with his elbows upon his knees, his fingers interlaced, he wondered about the man examining his most recent effort. Old Peter would find nothing in the composition of the paint to give him away. Better experts had performed the same tests, authenticating his forgeries. In Sabro's photographs were several distant views of a half-completed work that could very well be a beginning to the painting Peter had in his laboratory. Tomasi shrugged. His work had always passed the most exacting tests. The forger frowned. But this was the first time he had ever been under confinement awaiting a decision.

"Tomasi."

The forger looked at the back of the easel. "What is it, *artist?*"

"The lights. What are they for?"

Tomasi looked above the easel to the light array beneath the light bar, then laughed. "You needn't worry about them, old fraud. They are for use in doing scribed multi-layered paintings. You have more than you can handle with one layer."

"What are they *for?*"

The forger shook his head. "They are used in sequence to enable the neophyte artist to read only one layer at a time."

"You did not use them."

"I am hardly a neophyte, Balum." Tomasi cursed the opening he had given Balum to point out that he was no artist either.

"I have never seen them in galleries where layered paintings were on display."

Tomasi lifted his legs, swung them to his right, and stretched out on his mattress. "They are for painting, Balum. Not viewing. A layered painting is meant to be viewed in normal light. That is how it achieves its effects of depth and perspective. As with any other kind of work, a layered painting is meant to be viewed as a totality. The lights separate the layers to keep fuzzy-headed beginners from getting confused."

"How old is this medium?"

"Not as old as mind-painting. After the popularity of mind-paintings had pushed most real artists out of work, layered gel was developed in hopes of dazzling the host of illiterate clods back to real art. It was not very successful." Tomasi turned his head toward the easel. "Why?"

"Nothing. Curiosity." Balum remained silent for a minute. "Tomasi, I need your help."

The forger barked out a laugh. "*My* help?"

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"Yes. Come here and look at this." Tomasi remained on his platform for a moment, shrugged, then got to his feet. He walked around the right side of the easel and looked at the mind-painter's most recent effort. A much improved, but still grotesque, image of Baron Negay looked back at him—almost. The baron's dark eyes appeared to be pointing in two different directions. Balum pointed a brush at the image's right hand. "What is wrong with that hand? I have done it over a hundred times. Close up it looks fine . . . but it just isn't right."

Tomasi raised his brows. "It isn't just the hand."

"I know. But let us begin with the hand."

The forger looked down, then looked at Balum. "Lift your right hand."

"Eh?"

"Your right hand. Lift it and place the heel of it against your chin." Frowning, Balum complied.

"Well?"

"Touch your fingertips against your face. Where do they touch?"

Balum tried twice. "The middle of my forehead almost to my hairline."

"Use the end of your brush and measure the good Baron Negay's hand against his face."

Balum held the end of a brush against the image's hand, marked the end of it with his thumb, then brought the exposed end of the brush and placed the part marked with his thumb against the image's chin. The end of the brush rested just above the tip of Negay's nose. Balum's mouth fell open. "Incredible!"

The forger shook his head. "No, Balum. Inexperience; quite believable inexperience."

Balum frowned at the forger. "My mind-portraits have no problems such as this!"

Tomasi made two fists and shook them over his head. "Idiot! You old, old, *idiot!*" He pointed at his head. "A mind-painter orders his machine to play a thought. The machine already knows the limits and proportions of the thought, or if it doesn't, it searches your literal subconscious for the information." He slapped his hands together. "Blap! The machine squirts the proper intensity, order, and code of electrons upon a sensitized piece of glass! Less work and less skill than it takes to sharpen a hoe. *That* is what you call *art!*" The forger folded his arms. "When you have to consciously understand limits, proportions, colors, orders and then make your tools comply with them, it is *different.* Is it not, *artist?*"

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Balum slowly turned his head back to the painting. "Yes." He lifted his knife and began cleaning the entire canvas. "Tomasi, I shall repair the hand. I also want to know how to put the wrinkles and folds into cloth, as well as the different shades of color according to the angle of the source of light. And shadows. How do I make red darker to show red cloth in a shadow? I add black to it and it turns brown. I must know the colors of skin in different planes at different angles of light. How do I use the shading to make the subject stand out and assume substance rather than remaining as flat as the background? And the proportions of the body. I must know that. All of the facial expressions. Which muscles do I tighten and which do I leave free to make a smile—"

"I cannot compress twenty years of training into a couple of days." He turned and walked from the easel. "If you want me to be of help, let me paint the portrait." He stopped beside his bed platform, placed his hands upon his hips, and turned to look at the crates next to the door. "Why did you have your mind-painting equipment brought here?"

"I thought it might help me to think, relax. I simply don't have the time for it."

Tomasi sat on the edge of his platform, looked around the cell, then let his gaze come to rest upon the crates. He walked over and began opening the first crate.

Balum's head appeared around the edge of the canvas. "What are you doing?"

The forger pulled a black-and-gray metal box from the crate and examined it. "I'm bored waiting for your execution."

"Leave my equipment alone."

"I won't harm it." Tomasi snickered. "And what difference will it make in a few days in any event?" He opened the second crate as Balum disappeared behind the canvas.

Tomasi sat cross-legged upon one end of his sleeping platform looking at the video screen propped upon the other end of the bed. The screen was blank. The forger cursed beneath his breath, adjusted the pick-up band around his head, then turned a knob on the black-and-gray box. "Balum, I cannot get this thing to work."

"I cannot be bothered, forger."

Tomasi snorted, tore the pickup band from his head, and began rummaging through the small box filled with cables, connectors, and other assorted things. He found another pick-up band, hooked it up to the machine, and placed the band upon his head. Everything

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in place, he twisted a couple of knobs at random, then gasped as his eyes went dark and his mind filled with a scramble of horrible images. He felt the band torn from his head, and he sagged and breathed heavily as he rested against the machine. He opened his eyes to see Balum looking down at him. Balum sneered. "It seems that I am not the only fool in this cell." The old man pointed at the machine. "Look at what you have done. You have the equipment arranged for collaboration, at full power, and with one of the bands empty—besides the one that was on your head."

Tomasi swallowed. "My head. It filled with the most terrifying images."

"Of course. You left the second band connected, but empty. Hence, it picked up the available thoughts in the immediate area." Balum looked at the wall next to Tomasi. "You probably picked up whoever it is on the other side of that wall."

The forger frowned. "What do you mean: collaboration?"

Balum turned and walked back to the easel. "Certainly you must know what a collaboration is."

"In mind painting?"

"Of course. The machine, in effect, makes the two minds one. I never do collaborations, myself. It's unpleasant enough to use the machine for instructing my apprentice."

Tomasi looked again at the knobs and dials on the face of the black-and-gray box. "Could you arrange this thing so that I could teach you—"

"Impossible. It places thoughts—images—in another's head. It cannot control muscles. That I will have to learn for myself."

The forger sprang to his feet and ran to the easel. Balum was again scraping the canvas. "The other way around, Balum! You can place into *my* mind what you want painted. Then I can put the paint—"

"No!" Balum fumed for a moment, then looked up at Tomasi. "It is to be *my* painting! *My* painting!"

Tomasi wet his lips. "It would be no less yours than one of your mind-pictures. You put your image into the machine, and the machine does the work. You can think of me as the bristles of a brush, the machine my handle."

Balum's shoulders slumped as he turned and stared at the canvas. "But it must be *mine!* You would add things you have stolen from all the great masters. . . ." He sat back, glanced at Tomasi, then looked back at the canvas. "I think I can set the equipment . . . yes." He nodded. "Very well. Let's try it. Help me bring the equipment

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to the easel."

Tomasi grinned. "At last! Progress!"

The forger awakened as though from the dead. He stretched and winced at the aches in his back and legs, then he looked at his timepiece. Balum had kept him at it until well after three in the morning. Or was it the afternoon? He shook his head. He couldn't remember anything after Balum had thrown the switch. Fear tickled him as he glanced at his timepiece. Ten twenty-eight. Morning or night?

He looked toward the easel. The floor around it was covered with papers from the pad. The walls to the side and behind the easel were covered with drawings, as well as color-mixing experiments. As he watched, another sheet of paper leaf-dipped to the floor, then the sound of a scriber on gel. Tomasi sighed and rolled over. After the scratching had stopped, there was a long silence. He turned his head back toward the easel. "Balum?"

"Yes?"

"Is this morning or night?"

"I do not know."

Tomasi rubbed the sand from his eyes. "I can still paint the portrait for you."

"No." There was a short pause. "Thank you, but no. Everything will be fine. The experiment worked."

"Oh?" Tomasi began getting up. "I do not remember doing anything. You did not say the machine would do that."

"Stay away. Wait until I am finished."

Tomasi shrugged and stretched out again. "What did I do?"

"What I told you to do."

Tomasi looked again at his timepiece. If it was morning, the guard would bring their trays in an hour and a half. If the trays came, Balum would have twelve more hours added to his two days. If the trays did not come, the mind-painter would have less time. More or less, depending upon when the baron roused himself from his silken sheets. He lowered his arm and curled up, his head resting against the coolness of the wall. He paused, then brought his head away from the wall in horror. His ears could not hear it, but the vibration through his bones painted a picture of screaming terror coming from the other side of the wall. Was the voice male or female, or even human? The forger shut his eyes and turned his back to the wall.

"Balum?"

"Yes?" The scratching continued without pause.

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"How did you get out of the fields?"

"A curious question." More scratching. "My hands were injured in a threshing machine. I could do no work and my father gave me to old Yate, keeper of the old baron's accounts. Yate taught me numbers, and I needed no hands to use the voice equipment. I found that I could draw pictures on the screen with numbers—the accounts were very boring. Yate punished me the several times I was caught not doing my assigned work, but this brought me to the attention of Norris. He was the first mind-painter here. He took me on, and when he died, I replaced him."

"Your hands look fully recovered."

"They are. But I enjoyed mind-painting, and it gave me extra money to make my family's lot easier . . . while they lived."

Tomasi looked into the darkest corner of the cell. "Did your family die in the last population control plague? Mine did."

Balum was silent and the scratching stopped. "All but my father. He died in the stocks . . . for speaking against the baronage." The scratching resumed.

Tomasi felt very weary.

. . . he dreamt of his father—brutish peasant lout poisoned with brew of his own invention. His mother . . . "Tomasi, you have a great gift from God. You can be more than we are. More." He painted signs for the small village merchants; cups, plates, and platters for the potter; baubles for the village jeweler. Then the great Sabro, heir to a barony in Yorkton, came to the village. Sabro had seen Tomasi's work and had arranged for the boy's instruction at the great artist's own studio. There, with five other boys, he studied, glorying in his freedom from the fields, from hunger, from endless brutality. The happy years passed.

"Tomasi. I have no more to teach you. You mimic my work, and the work of my colleagues and your fellow students with frightening accuracy."

"Thank you, Excellency."

"That was no compliment, boy. We have machines that do the work of copying. When will I see something of yours? Something of your own?"

"I . . . I do not understand, Excellency. I have done everything that I was told."

The great Sabro looked down and shook his head. When he looked up, his eyes were cold, distant. "I apologize, Tomasi. I mistook your gift for mimicry as a calling to the arts. I envy you your every skill;

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I weep at your inability to create." Sabro lifted the young Tomasi's slender hands and looked at them. "A waste such as this must have a purpose in Heaven's scheme. Look for it, Tomasi. Look for it, but not here. Here we are but mere artists."

Ten years of failure, then an opportunity. Sabro burned along with an unknown number of his completed and half-completed works. Heaven's plan, at last, had borne fruit. Tomasi the hungry became Tomasi the dealer in fine art—

Tomasi lost count of the times he was placed before the easel, then his mind blanked as Balum again turned on the machine. There were no images, save a feeling of being drugged. Each time there was nothing on the canvas as he was placed under, nothing when he awakened. Then Balum told him to go to sleep, and to stay away from the easel.

Tomasi awakened and the cell was dark. He could hear Balum's gentle snoring coming from the other sleeping platform. The forger rubbed his eyes and pulled the lace collar from around his throat, begging the Holy for a simple soap and shower. Sitting up and swinging his feet to the floor, he studied the dim outlines of the easel and canvas made visible by the crack of light from under the door. He stood, stretched his aching muscles, walked behind the canvas, and illuminated the light bar. Turning, he saw the image of Baron Negay spring from the canvas. He nodded and smiled. The old man's visions appeared to have worked. Layer by layer Tomasi had worked the gel. Balum himself had assembled the layers.

The forger sat on the stool and examined the multi-layered painting. The depth and perspective were excellent, and the image of the baron showed the little pirate at his best—at better than his best. The drape of the baron's cape was rich and realistic.

Tomasi sighed. It had worked. He looked again at the painting—the baron's eyes. A small thing, but the eyes made Tomasi feel uneasy. He felt an urge torn between laughter and rage. He stood and backed away from the painting. Yes. Laughter and rage . . . and, was it, could it be, hope? The forger frowned. It was a competently done portrait; but no more than that. From where came the humor? What caused the feeling of anger? The painting disturbed him.

Reaching to the wall, Tomasi extinguished the light bar and illuminated the first whitelight. He turned to the painting and sank to the stool in laughter. Baron Negay stood naked, his face attempting to maintain a measure of dignity while his eyes looked down

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and his hands covered the obvious.

—Second whitelight. The naked baron's features were exaggerated into a comic representation of a human—thickened lower lip, protruding upper teeth, bulging eyes, knobby knees. Again Tomasi laughed. "Balum, this deserves a medal."

—Third whitelight. Still a representation, but no longer comic. The eyes, mouth, and posture spoke of arrogance, cruelty, sadism. The background, skillfully hidden by the first layer's trees and shrubs, became numberless, nameless corpses. Tomasi studied it for a long moment. The figure spoke for his dead mother—for everyone's dead kin. There was the rage. The rage that all put aside in favor of immediate survival. Tomasi reached out his hand.

—First redlight. Negay, fear upon his ugly face, clutched his bleeding belly. Blood spattered his pale skin, while the background was one of fire; the dead rising to take up arms.

—Second redlight. The crouching figure rotted. The eyes were gone, the skin purple and coming free from its bones as though in flight. The dead joined the living, marching under the same banner.

—Fourth whitelight. A skeleton, crouching down further, its gray-white fingers clutching after its fleeing subjects. Tall spires of glass and metal rose behind it, diminishing the bones with their power and grandeur.

—Blacklight. The ragged edges of a ghostly apparition fluoresced and clawed against the blackness that surrounded it. The eyes and heart were hollow; the evil remained to survive the corpse.

—Bluelight. The image was gone, replaced by cloud-tufted blue skies dotted with long-winged white birds. It took a moment, but the forger identified the emotion he felt. Elation; freedom.

Tomasi turned off the light array and returned the cell to illumination from the light bar. He looked around the canvas to see Balum sleeping peacefully upon his platform. Emotions swirled in the forger's head: joy, gratitude, hate, envy, sorrow. He looked back at the normal-light figure of the young Baron Negay. What would the creature do when he discovered the truth about his portrait? And Tomasi had no doubt that old Peter would discover it. The truth created by Balum would destroy both painting and . . . and artist. *Yes; artist.*

The cell door slammed open. Heavy footsteps approached the easel, and the guard called Gunder came around the edge of the canvas. He glanced at the painting, then looked at Tomasi. "Did you do this?" The guard's thick fingers motioned toward the canvas.

Tomasi shook his head. "No. It is Balum's."

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The guard turned his massive head toward the painting. "Ha! Didn't think Balum had it in him. . . ." He cocked his head to one side, then frowned.

Tomasi half-smiled and turned to face the guard. "What do you think of it?"

Gunder frowned more deeply, then shook his head. "I don't know." The guard studied the painting for a moment longer, then tore himself away as though by force. "You are free to go. The baron is satisfied that your painting is genuine. Your draft is waiting with the attendant standing by your cab."

Tomasi nodded, stood, then began gathering up the penciled studies scattered upon the floor. "Would there be any objection if I took these with me?"

The guard shrugged. "They belong to Balum." Gunder went back to studying the painting.

Tomasi finished selecting the studies that he wanted, then walked to the mind-painter's side. He sat upon the edge of the sleeping platform and shook the old man's shoulder. He whispered. "Balum. Balum."

The old man opened his eyes. "You have seen it?"

Tomasi nodded. "Yes."

"What do you think?"

The forger smiled as his eyes brimmed with moisture. "Do you care what I think, Balum? You know if it is right."

The mind-painter closed his eyes, then nodded. Opening his eyes, he turned his head and noticed the guard studying the portrait of Baron Negay. "We have touched the brute."

Tomasi shook his head. "You, Balum. I was only the brush in your hand. You have touched him."

Balum looked back at the forger. "What will you do, Tomasi?"

Tomasi held up the sheaf of papers he had collected. "May I take these?"

Balum closed his eyes and nodded. "I suppose I am to become the latest victim to be exploited by the great forger Tomasi."

Tomasi smiled and nodded. His face grew grim. "You know Peter will examine the painting with the light array, and what will happen afterwards."

"Yes."

Tomasi stuffed the papers inside his blouse. "Balum, the sole work of a great artist should bring a good price." He smiled as he buttoned up his blouse, then bent down next to the old man's ear. "It may even bring a bloody empire to its knees."

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Tomasi stood and touched the sleeping Balum's hand. *Farewell, artist.*

Gunder walked up and stood next to the forger. "It is time to go."

Tomasi stood and walked toward the cell door. "Tell me, Gunder. Have you come to any conclusions about the portrait?"

The guard left the door open and steered the forger toward the elevator. He shook his heavy jowls, his gaze fixed to the floor. "No. I must look at it again: It . . . disturbs me somehow."

Tomasi stepped into the elevator car and let the door cut off the screams from the dungeon.

. . . Whoever the unknown artist was that made over fourteen hundred copies of the portrait of Baron Negay, there can be no doubt that the painting became a symbol of the uprising that soon followed its appearance in every dominion of the former empire. Exhaustive investigation has failed to uncover the name of this artist who encoded all of his copies with the simple inscription: "For Balum." The only Balum appearing in the baronage records of the period was an insignificant mind-painter, coincidentally of the Negay household, who was burned at the stake in 2912 GS. . . .

—*Stanley,* Darktime Artistic Curiosities, *(Oxford, 3106 GS)*

GOOD NEWS

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TITAN'S LOCH METH MONSTER
by Martin Gardner

Four months ago we left Larc Snaag, captain of the spaceship *Bagel*, and his exobiologist, Stanley G. Winetree, exploring the murky surface of Titan, Saturn's largest moon. After analyzing Titan's tiny life-forms—Winetree called them "polybugs"—the two men left the ship for their second exploration of the ruddy satellite.

The temperature on Titan's surface, about minus 300 degrees Fahrenheit, was so low that the methane in Titan's nitrogen-rich atmosphere could form a liquid. The intrepid explorers were not surprised when they came upon an enormous lake of methane.

They rotated their heads from side to side so that the light beams from their helmets played over the edge of the black ominous liquid. A line from Edgar Allan Poe jingled through Snaag's mind:

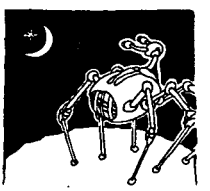
Resignedly beneath the sky
The melancholy waters lie.

Suddenly a creature emerged from the heaving liquid. An enormous snakelike monster, with a single red eye that glowed at the center of its head, crawled out on the dark sand and moved slowly toward Snaag.

Winetree, who was standing off to one side, was the first to act. He yanked a laser gun from his belt and sliced the sea serpent neatly into thirds by two parallel straight cuts.

Assume for puzzle purposes that the serpent was cut by two parallel planes into three pieces of identical length. The length of each piece was ten meters plus half the length of one of the pieces.

How long was the creature? See page 69 for an answer.



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EQUILIBRIUM, STABILITY, FEASIBILITY, & ALL THAT

by Milton A. Rothman

Dr. Rothman is a distinguished physicist with a short, white beard.

1. Reality Testing.

The abiding interest of my life has been to seek out the boundary line between fantasy and reality. Every worker in science takes part in this search; it is one of our fundamental purposes. Where we locate the line determines whether we are engaged in real science or in science fiction.

In science fiction it is allowable to make the fantasy/reality boundary purposely fuzzy—to allow things to happen that probably cannot happen. However, when SF writers start sitting on prestigious panels at the meetings of the American Association for the Advancement of Science, or when we start lobbying Congress for support of particular technological advances such as space colonies, then we want to be as clear as we can concerning the location of reality's border.

First, let me be clear about what I mean by fantasy in this context. I am referring to fantasy in the psychological sense: images within the mind, images of events that have not actually happened. This concept of fantasy covers an enormously broad range of thoughts—far broader than is usually implied by the technical label of fantasy that we use in classifying types of literature. Thus, daydreams, reverie, planning for the future, designing a house, working out the plot for a story—the mind engaged in each of these activities is dealing with fantasy.

Even a supposedly rock-hard operation like writing down an equation to describe the behavior of some kind of machine—this is fantasy, also. First because it is an operation going on in the mind, and second because the equation cannot hold within itself all the enormous number of variables that actually determine the operation of the machine. Not until the machine is actually built can you be completely sure how it will work. The operation of the actual, physical machine—that is reality. The equation within the mind is fantasy.

To paraphrase Korzybski, the equation is not the same as the

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physical system that it represents. The aim of science is to know whether the equation represents reality closely enough so that it gives an adequate description of how the machine is going to work.

In this light, then, all of science fiction falls within the domain of fantasy. Types of fantasy in literature fall along a well-known spectrum, ranging from "pure fantasy" on the left (worlds governed by laws arbitrarily different from those of our own), to hard science fiction on the right, where we extrapolate within worlds operating under our own familiar laws of nature.

Any scientific development proposed for the future—even in the hardest of hard science fiction—is fantasy until somebody actually builds the machines to make it work. Then it becomes reality.

The bridge between fantasy and reality is reality-testing. Scientists do reality-testing whenever they make predictions from theory and then perform experiments to see how accurate the predictions are. Everybody does reality-testing all the time. When Joe Smith thinks he is going to become a famous movie actor, this is fantasy. It may remain nothing but fantasy, or it may turn into reality. The only way he can find out is to test the reality.

The chief requirement for sanity is an adequate ability to test reality. Paranoia and schizophrenia are marked by lacks and omissions in this ability.

In order for a fantasy to become a reality, that reality must be possible. In addition, it must be feasible. Space travel and nuclear energy, fantasies of our youth, turned out to be not only possible, but feasible.

The terms "possible" and "feasible" are sometimes used interchangeably, but I would like to keep them separate. A plan, a device, or a system is possible when it does not violate any of the fundamental laws of nature. Perpetual motion devices are impossible because they violate the law of conservation of energy. Reactionless drives are impossible because they violate conservation of momentum.

On the other hand, there are devices which do not violate the laws of nature in a fundamental sense, but still cannot be built for reasons of feasibility. For example, 25 years ago it was possible, but not feasible, to build a computer with a million vacuum tubes. It would have been too expensive; it would have been too big; and about 1,000 vacuum tubes would have been burning out every day, so that 20 hours a day would have been spent just changing tubes.

Whenever a major project is considered, the first sensible task is a feasibility study—an engineering investigation into the practi-

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cality of the scheme. This investigation covers many aspects: Is the scheme possible (in the fundamental sense)? Is there enough money in the world to finish it? Is it profitable (in some sense)? Are materials available with the required strength? What unknown factors may stop the correct operation of the scheme?

For example, think of thermonuclear power generation. For the past 25 years experimental and theoretical work has been carried on to demonstrate the feasibility of the concept. Theoretically, there are no impossibilities involved in the central idea. But there are so many peripheral problems to be overcome that feasibility still has to be demonstrated. Furthermore, in fusion the theory is so complex that a purely theoretical feasibility study would satisfy no one. Feasibility must be demonstrated experimentally, in the laboratory.

The feasibility study has become a standard operating procedure in the world of science and technology. Yet somehow within the world of science fiction such activities are scorned. Indeed, the very use of the word "impossible" has become a mortal sin, carrying with it the inference of pessimism, backwardness, obstructionism, and the like. I feel that whenever I use that awful word I am being a spoilsport.

Yet science itself is the study of *"what is impossible?"* The fundamental laws of nature are statements that tell us what can be done and what cannot be done. In recent years it has become fashionable in the world of theoretical physics to take the attitude, "Anything will happen unless there is a specific rule that forbids it."

That's a nice optimistic point of view. But focus attention on the rules that forbid the forbidden events. These are sometimes called "selection rules," because they select, out of the infinity of things that might happen, the few things that are allowed to happen. Everything else is forbidden. Indeed, in atomic and nuclear spectroscopy a common term is the "forbidden transition." If it were not for selection rules and forbidden transitions, the science of spectroscopy would be hideously complicated, because every imaginable transition would take place and the spectrum of any element would contain hundreds of lines more than actually are found.

Following the philosophy that anything can happen unless expressly forbidden, the laws of nature become selection rules—statements telling us what things are not allowed to happen. Taking this attitude, we cast the law of conservation of energy (or momentum, or electric charge) into the following form: No event can take place in a closed system which changes the total amount of energy (or momentum, or electric charge) in that system.

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These laws tell us what cannot happen. They do not tell us what will happen.

Whenever we try to predict what may or may not happen, there are two fundamental kinds of errors that can be made:

Error 1. To say something is impossible when it actually is possible.

Error 2. To say that something is possible when it actually is impossible.

The first of these errors is what Arthur C. Clarke refers to in Clarke's Law, where he berates elderly, conservative scientists for holding back progress by claiming the impossibility of developments that later turn out to be quite possible. There is no denying that some scientists have made such errors. Indeed, in *The Structure of Scientific Revolutions,* Thomas S. Kuhn argues that scientific progress is frequently made by a process in which the scientific community first opposes a necessary change, until finally there is a more or less sudden shift in the perceptions or beliefs of the scientific community and the new "paradigm" replaces the old.

In other words, every new idea has to prove its worth before it is accepted. This is part of reality-testing. This is the way science continuously improves the validity of its ideas. It's an evolutionary struggle. (I wish some historian of science would study how often scientists oppose a new idea compared with the number of times they accept a new idea without resistance.)

Without reality-testing we would continually be falling into the second class of error—believing that something can happen when it really can't. I can think of a number of scientists who are flirting dangerously with this error—those doing psionic experiments with elaborate electronic setups. If those experiments are really being done in a purely objective, reality-testing manner, then they are on safe grounds. But if the experimenters *believe* ahead of time that they are going to get positive results, then they are skating on thin ice. Those who believe too hard in the outcome of their experiments are prone to make mistakes. This is a well-known psychological principle and is the reason for the use of the double-blind method in research. I've seen this kind of error arise even in experimental physics research of the most straightforward kind. Whenever you are looking for small effects masked by statistical experimental fluctuations it is essential to guard against wishful thinking in your analysis of the experimental results. It is doubly important in ESP experimentation.

It is in experimentation that we meet the boundary between fan-

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tasy and reality. In fantasy anything can happen. Reality-testing brings us down to earth.

What does reality-testing have to do with science fiction? After all, science fiction is only fiction. Isn't our main purpose in science fiction to stretch our imaginations as far as possible? True. If our only goal is entertainment, then feasibility doesn't matter. Plausibility is the only thing that counts.

But there are other goals. The community of science fiction perceives itself as an advocate of future change, both in technology and in sociology. Science fiction writers claim to point the way, as we did with space travel and nuclear power.

How much influence will we have? The amount of influence will depend on the accuracy of our predictions and the feasibility of the projects that we support. If we tend to push for developments that turn out to be completely unfeasible—even though captivatingly imaginative—then we are going to lose the people that we must go to for money: the members of Congress.

If science fiction people are going to have any kind of influence in raising the billions of dollars required for planetary exploration, space habitats, and solar power satellites, they must learn to consider the feasibility of the projects that they support. Congress is too hard-bitten, too skeptical, too burdened with the necessity to save its money for mundane matters to waste its resources on badly thought-out schemes, no matter how wonderfully imaginative.

That's why we have to avoid errors of the second kind. In fiction I don't worry. At least one impossibility per story is standard operating procedure. But when I see pieces of writing labeled "Science Fact" dealing with what is clearly fiction, then I start to worry. I not only worry, but I become extremely irate.

In previous articles and books I have discussed at great length the way the fundamental laws of nature limit the things you can do. Now I would like to look at some other kinds of questions that come up in feasibility studies.

For example: If you put up a tower how do you tell whether it will stay up or fall down? Or, if you build a radar-controlled gun director will it take up its aim smoothly, or will it oscillate crazily? If you put a Ringworld around the sun, will it stay where you put it?

Thinking about questions like these moves us into profound areas of dynamics, where equilibrium and stability are the keywords.

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2. Equilibrium and Stability

When we put a structure together we usually would like it to stay put together. Generally we don't want it to fall down; and except for special purposes, such as in timepieces and radio transmitters, we don't want it to break into spontaneous oscillation. In other words, we would like it to be in stable equilibrium.

We learn in elementary mechanics that a system is in mechanical equilibrium when all the forces acting on it add up to zero. So, looking at a ball sitting on a flat floor, we see gravity pulling down on it, the floor pushing up on it, and no forces acting to the right or to the left. As a result, all the forces add up to zero and the ball doesn't go anywhere. (See Fig. 1)

This example leads us to expect that if we have a system in equilibrium it will remain solidly where we put it. The trouble is, this kind of simple knowledge sometimes fools us.

Consider the situation shown in Fig. 2, where we see a closed container half full of water. The only unusual thing about this situation is that the water is on top. Already it feels strange.

From the viewpoint of static forces the system is in equilibrium. Gravity is pulling the water down, but the pressure of the air in the bottom half of the container is enough to hold the water up. Ergo, the water should stay where it is.

But you know in your bones that it won't. You just feel intuitively that sooner or later the water is going to come crashing down. What is wrong with the equations that tell us the system is in equilibrium?

There is nothing wrong with those equations, except that they don't go far enough. Static equations of equilibrium don't tell you enough about a system with moving parts. You must use dynamic

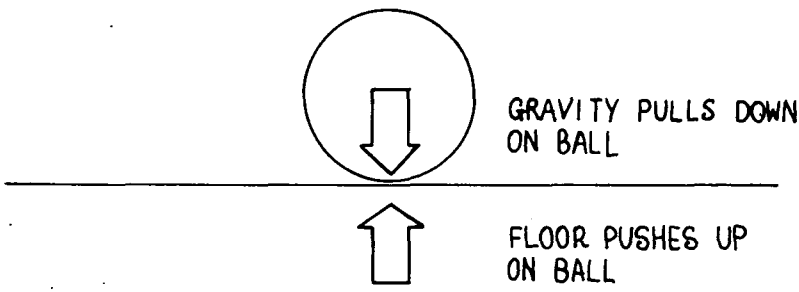

Fig. 1. A ball resting on a horizontal floor is in equilibrium because all the forces acting on it add up to zero.

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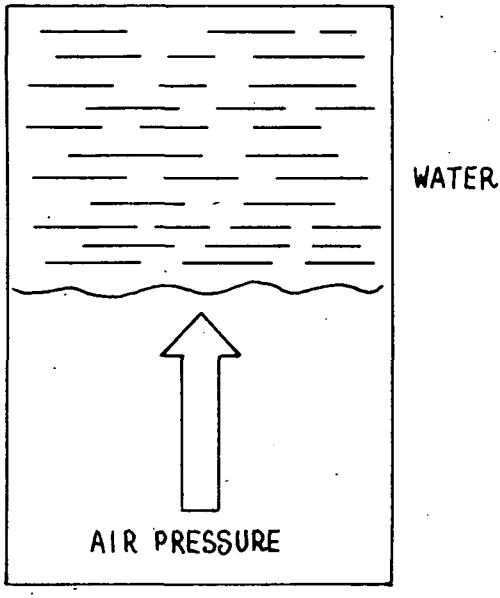

Fig. 2. A closed container with water in the upper half. The pressure of the air in the bottom half keeps the system in equilibrium. Is the equilibrium stable?

equations that tell you about the motion of the parts. And what the dynamic equations tell us is this: even though the water and the air pressure are in equilibrium, it is in *unstable* equilibrium. This means that the slightest perturbation of the air-water interface will quickly get bigger and bigger until the water just plops down to the bottom of the container.

Any system put into an unstable condition is going to escape from that situation as soon as it can, to search for a condition of stable equilibrium. The example of the water in a glass is one of a class of hydrodynamic instabilities called a "Rayleigh-Taylor instability."

A roller-coaster track gives us the simplest model of the stability problem. (Fig. 3) The car on the flat section of the track is in equilibrium—there is no force moving it either to the right or left. Furthermore, if you do move the car a short distance one way or the other, it just stays where you put it. So we call this neutral equilibrium.

On the other hand, consider the car at the top of the hill. It is also in equilibrium if it is at the very peak—at the point where the track is horizontal. But displace the car a little bit to the right or

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the left and it will slide down the hill *away from* the equilibrium position. Therefore this is a condition of *unstable equilibrium.*

The opposite situation is found at the bottom of the hill, in a valley. Whenever the car is displaced from its position at the bottom of the trough, it will automatically tend to return to that bottom position. The bottom point is therefore a place of *stable equilibrium.*

We see, then, that it is not enough to know that a system is in equilibrium. We must also know whether the equilibrium is stable, unstable, or neutral. There is also the possibility of a metastable situation. Here the car is in a stable state, but if you move it more than a little bit to the right, it will fall out of its trough down to the more stable state. Examples like this are common in atomic and nuclear physics, as well as in chemistry.

For example, think of a container filled with so much water vapor that its relative humidity is greater than 100%—it holds more water vapor in the air than it normally can carry. Yet nothing will happen until a nucleus appears on which droplets of water can condense—a speck of dust, a bunch of ions. We say that the air in the chamber is supersaturated. What we have, of course, is a cloud chamber, used for detecting charged particles. The supersaturated air may be thought of as being in a metastable state.

The most useful way of thinking about the stability of any system is in terms of the system's potential energy. Going back to the roller

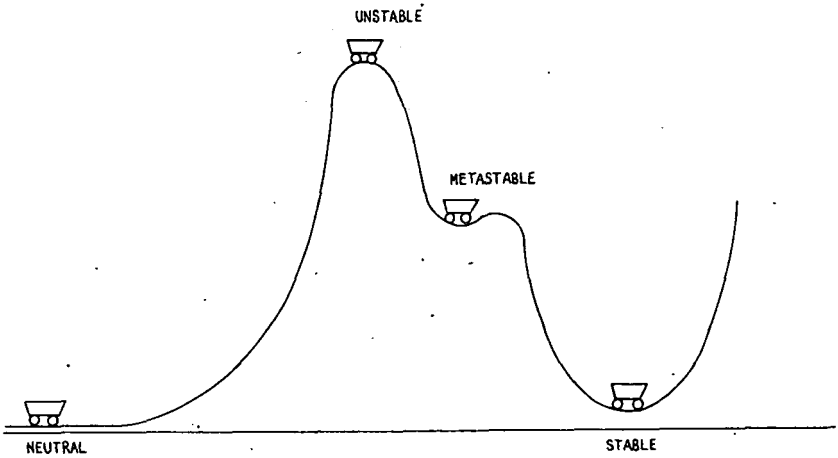

Fig. 3. A roller-coaster, showing positions of stable, unstable, metastable, and neutral equilibrium. The diagram may be considered a plot of potential energy vs. position.

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coaster, we define the system's gravitational potential energy as being the height of the car multiplied by its weight. When the car is at the highest point on the track it has maximum potential energy. At the lowest point it has minimum potential energy. Indeed, the track itself plots a curve of potential energy versus distance along the ground.

We notice that equilibrium takes place whenever the track is horizontal—either at the flat section, or at the maximum or minimum points. But at the maximum point the equilibrium is unstable, and at the minimum point it is stable. This means that the car always tries to go towards the place where its potential energy is a minimum. It likes potential wells; it avoids potential hills.

This is a general theorem true of all systems, regardless of how many physical parts the system contains, and including such things as gravitational or electromagnetic fields. For any system it is generally possible to write an equation giving the potential energy of the system as a function of position in space. We then make a very general prediction about the behavior of the system: if left to itself the system will always have a tendency to arrange itself in such a way that the potential energy will be a minimum, and the potential energy equation allows us to find what that arrangement will be.

With this basic concept we can analyze the stability of all kinds of systems. We know, for example, that a solid structure will fall down if its center of gravity is not located above the base of the structure. That's why a skinny pole will not stay upright unless you fasten it solidly to the ground. It is unstable.

At least one famous science-fictional structure suffers from an instability problem. Larry Niven's Ringworld turns out to be gravitationally unstable. If you calculate the potential energy of a solid ring around a sun, you find that when the sun is at the center of the ring, the potential energy is a maximum. This means that if either the ring or the sun is slightly displaced from the equilibrium position, the two bodies will attract each other and will move toward a collision. This is because the side of the ring closer to the sun has a greater attraction than the farther side, as shown in Fig. 4. (It's a nice problem in theoretical mechanics, giving practice in using elliptic functions.)

The Dyson sphere, used by Tony Rothman in *The World is Round,* is a spherical shell surrounding a sun. A well-known theorem states that there is no gravitational field inside a hollow shell. That is, if you put an object anywhere inside such a shell, the gravitational forces from all parts of the shell will cancel each other, leaving zero

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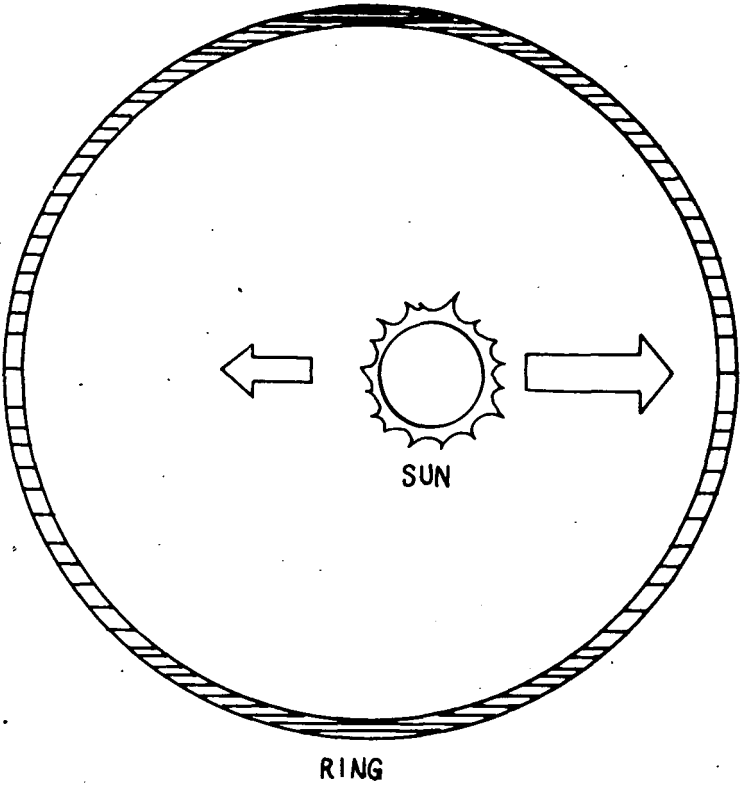

Fig. 4. A Ringworld is in unstable equilibrium, because if the sun is a little bit off center, then the gravitational force from the near side of the ring is greater than from the far side.

net force acting on that object, in contrast to the Ringworld. (The same thing is true of electric fields inside charged spheres. The experiments verifying this theorem are among the most precise in all physics.)

As a result of this fact, the Dyson sphere is in neutral equilibrium—there is no tendency for it to move one way or another. However, if there are perturbations due to extraneous forces acting on either the spherical shell or the star within it, then these forces will start the sphere moving relative to its central sun, and eventually there will be a collision.

Interestingly enough, it is difficult for gravitational perturbations

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to destablize this sytem, because any gravitational forces acting on the sphere from the outside will make the sphere move exactly the same as the star at its center. (This was the discovery that made it possible for Newton to utilize his law of gravity in a simple way—the fact that spheres or spherical shells attract each other as though all their mass is located at the center.) However, unbalanced solar winds or magnetic fields would tend to push the Dyson sphere off center.

Considerations of stability are of supreme importance in nuclear and atomic physics. Every atom exists normally in its "ground state," which is the state of lowest energy, of stable equilibrium. However, all the interesting things happen when the atom is given additional energy, putting it into an "excited state." (This is true both for the orbital electrons and for all of the particles within the nucleus.)

Usually when an atom is excited, it immediately drops back to its ground state by emitting one or more photons of radiation. (This is what produces the lines in the optical spectrum.) But there are certain metastable states that allow the atom to remain excited for a period of time before dropping back. It is this principle that allows us to build lasers. The orbital electrons of the lasing material are raised up to one of these metastable levels, building up a population of atoms in excited states. They remain there until radiation of the right frequency comes along, stimulating the emission of more radiation from the excited atoms and causing them to return to the ground state until once more excited.

In nuclear and particle physics, questions of stability dominate the entire theory. Relatively few fundamental particles are stable; the rest are unstable and disintegrate into stable particles. The electron is one of the stable particles; this is because it is the lightest particle in its class—there is nothing lighter it can decay into and still satisfy the conservation laws.

The proton, until very recently, was considered to be completely stable, because it is one of the constituents of normal, stable matter and is never observed to change into anything else. Yet this was always a mystery, because there seemed to be no fundamental reason for this stability. Why shouldn't the proton decay into some of the lighter particles available?

The refusal of protons to decay was codified into a law called Conservation of Baryon Number. Yet this law didn't explain anything. There was no apparent reason for it.

Now it appears that perhaps the proton is not completely stable

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after all.

Steven Weinberg, of Harvard University, has used the new "Grand Unified Field Theory" to show that there is a way for protons to decay, and to show why these same protons have always seemed stable. It turns out that the "optimistic" idea discussed previously—the idea that anything can happen unless specifically forbidden—can be reversed into a "pessimistic" principle that says: "*Nothing will happen unless there is a reason for it.* Accordingly, we would not expect a proton to decay unless there were a specific force or interaction causing that decay. And, now that we know what to look for, we can specify the interaction responsible for the decay of protons into smaller and lighter things (such as a pion and a neutrino): and the mathematics can be used to predict the probability of this decay taking place.

The reason the proton appears so stable is that it lasts for a very long time—in the neighborhood of 10^{32} years, on the average. As a result, very few such events are noticed in ordinary matter under ordinary conditions. Experiments are now being carried on to detect proton decay, and their results will be watched with considerable interest.

There is a cosmological reason for this interest. The fact that our universe is made up mainly of ordinary matter, rather than equal quantities of matter and antimatter, is a considerable mystery. Current theories of the formation of the universe find it hard to explain why equal amounts of matter and antimatter should not have been created in the beginning. However, if it turns out that antimatter is more unstable than ordinary matter, one could visualize an opening chapter in universal history in which the created antimatter quickly decayed into other things, leaving behind the normal universe that we know.

The stability of the neutron has some important ramifications within the mythology of science fiction. Think of the many spaceships built of that impregnable material: neutronium. Dense, closely packed, neutral, impervious to the incandescent slash of energy beams, neutronium was an ideal material.

The trouble is, neutrons—by themselves—are quite unstable. A neutron can be considered to be a radioactive nucleus. It emits a beta particle (electron) with a half-life of 12 minutes, and turns into a proton. When it latches onto a proton, the neutron becomes stabilized; and we have a nucleus of deuterium (heavy hydrogen). On the other hand, if we try to hang two neutrons onto a proton, we get a combination which is also unstable—or at least metastable. Trit-

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ium is radioactive, with a half life of 12 years, turning into helium-3 as one of the neutrons changes into a proton.

We find this behavior throughout the table of isotopes: any nucleus containing too few neutrons decays by positron emission, while any nucleus containing too many neutrons decays by electron emission. In between there is a region of stability where one or more stable isotopes can exist. Just the right mixture of neutrons and protons is needed for stability.

Thus, if you are going to build a spaceship out of neutronium, you have to do something to stabilize the neutrons, or you will find half your ship evaporating every 12 minutes. If you just add protons you are merely creating normal matter. You have to invent something else.

Maybe you can stick it together with gluons.

3. Dynamic Systems.

If you pour water into a tub just as fast as it is running out of a hole in the bottom, the tub will fill to a certain level and remain there. We can think of this as a dynamic equilibrium, or more properly, a steady state. The same sort of thing happens in a population where as many people die per year as are born. The steady-state population that results is the goal we are approaching in this country. An exponentially increasing population, on the other hand, represents a kind of instability resulting from positive feedback.

What is feedback? In most dynamic systems there is an input and an output. If some of the output is returned to the input you have feedback. For example, you put money into a bank. That's input. The output is the money returned, plus interest. If you feed that money, with interest, back to the input, what you are doing is compounding your interest. The result is an exponential growth in the amount invested.

Feedback that tends to increase the output is positive feedback, usually resulting in exponential growth. Population growth is one example. A signal fed back from the output to the input of an electronic amplifier is another example. The old super-regenerative circuit, popular in the primitive days of radio before the superheterodyne came along, employed positive feedback to amplify the signal over and over again, looping it through the same amplifier many times. In this manner the weak gain of the amplifier was enhanced.

The main drawback to that scheme was that positive feedback gives rise to instability. In this case the inductances and capacitances in the circuit cause the instability to take the form of oscil-

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lations rather than exponential growth. The amplifier turns into an oscillator, resulting in squeals and howls issuing from the loudspeaker. You get the same result by putting a microphone in front of a loudspeaker.

The moral is that any time you have a system that includes some kind of input of energy or amplification, you have to make sure that there is no way for positive feedback to take place accidentally, for the result can be an instability that causes the output to go way off scale or else to break into oscillation.

All sorts of mechanical systems are prone to these hazards. In any kind of automatically controlled mechanism, such as an autopilot, it is important to design the system so that when the machine approaches its desired position it doesn't overshoot the mark by too much. For then it will tend to oscillate back and forth around the equilibrium position—a kind of action called "hunting." On an automobile, shock absorbers prevent oscillation of the car on its spring mounts.

Movable structures can become unstable in an amazing number of ways. Who can forget the film of the collapse of the Tacoma Narrows Bridge in 1942? The tall suspension bridge had not been in place for more than a year when a high wind came roaring down the canyon, setting the bridge into violent oscillation with a twisting motion that in minutes brought it completely down, crashing into the river below.

A steady wind is a great generator of waves. Let a wind move across a smooth water surface and soon ripples form. They grow larger until they become great waves, many feet high. Whenever a steady force has the capability of setting a system into oscillation, we have all the earmarks of a dynamic instability.

Air blowing across the lip of an organ pipe acts as though it can't make up its mind whether to go inside or outside the pipe, so it alternates between both motions, causing the air inside the pipe to vibrate. A flag flapping in the breeze does the same thing.

Robert Goddard, the rocket pioneer, fell afoul of the mechanical stability problem in an interesting way. Photographs of his first liquid fuel rocket, vintage 1926, show the rocket motor sitting *atop* the fuel tanks, separated from them by a flimsy framework of metal tubing. Why did Goddard put the motor up front, instead of in the rear as they are now usually placed?

The reason is this: Goddard had been afraid that putting the motor in the rear, so that it pushed the contraption, would make it unstable. After all, if you lay a meter stick on the floor and push it

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from behind, it is hard to make it go in a straight line. But if you pull it from the front, then it follows easily.

But what Goddard forgot, in that first try, was that the rocket motor is fastened rigidly to the framework, so that if the vehicle deviates ever so slightly from its vertical path, the thrust of the rocket will now continue to push it in its new, inclined path. The motor in front is just as unstable as the motor in the rear! Goddard, realizing this, knew that his main job was going to be the invention of automatic control devices to keep his rockets on the desired path. Space flight was made possible by the use of negative feedback to eliminate instabilities.

There are a number of situations where such questions of dynamic stability or instability are crucial in determining possibilities for the future.

For example, the problem of carbon dioxide in the earth's atmosphere has a number of feedback cycles built into it. It's well known by now that the concentration of CO_2 in the air has been steadily increasing during the past century. Because of increased absorption of infrared radiation by the CO_2 we expect a warming of the atmosphere to result. However, this warming may produce increased evaporation of water from the oceans, causing an increased amount of cloud cover. From this effect, two contradictory consequences may come about. One, greater cloud cover increases the reflectivity (albedo) of the atmosphere, causing less energy to be absorbed. Two, greater cloud cover reduces the effectiveness of solar energy, causing more coal to be burned, and increasing the CO_2 concentration at a greater rate.

One effect gives negative feedback; the other gives positive feedback. It is easy to see why modelling of the carbon dioxide problem is such an infernally difficult problem and why it is so hard to predict precisely what is going to happen. The best results so far indicate that the temperatures are going to increase around the world.

One answer to the carbon dioxide question is to go to nuclear energy. To avoid most of the problems of radioactivity we would like to use thermonuclear fusion. In the fusion research program, the question of instabilities has been *the* major question.

Production of energy by fusion requires confining an extremely hot mass of deuterium-tritium mixture for a period of time long enough for the nuclear reactions take place. The first proposed methods involved suitably shaped magnetic fields to confine the hot ionized gas (plasma). Later on, schemes were developed in which the plasma was heated so suddenly (in billionths of a second) that the

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reactions could take place before the gas had time to disperse. These inertial confinement schemes involve heating the plasma either by powerful laser beams, or else by beams of beams of electrons or other charged particles.

As soon as you try to confine a plasma in a magnetic field the first thing you discover is that the plasma does not want to stay confined. It is like a quivering mass of jello that tries to escape through the magnetic lines of force. The basic cause is the hydrodynamic instability (the Rayleigh-Taylor instability) that we described previously in connection with the upside-down water glass. The magnetic field is trying to compress the plasma, which wriggles and squirms until it gets free.

Fortunately, the instability can be stabilized to some extent by shaping the magnetic field properly. In the case of toroidal devices such as the Stellarator and the Tokamak this is done by twisting the magnetic lines of force as they go around the doughnut.

Even the laser-heated, inertially-confined plasma can suffer from instabilities, because the light beam is pressing inward on the plasma and at the surface of the plasma waves can form.

But the gross hydrodynamic instability is only one of many kinds of instabilities that can develop in a hot plasma. A confined plasma—consisting of charged particles gyrating in a magnetic field—is one of the most complex systems that has ever been studied. It is a system that can oscillate in several ways, and it has a large number of resonant frequencies—the ion-cyclotron frequency, the electron-cyclotron frequency, the upper hybrid frequency, the lower hybrid frequency, the plasma frequency, etc. Under proper conditions, one or more of these frequences can be excited into oscillation. And oscillations in the plasma immediately cause a diffusion of plasma through the magnetic field. They cause the confinement to be lost.

Thus these micro-instabilities, as they are called, are a major source of worry in the development of thermonuclear fusion. A large part of the work done during the past 25 years of fusion research has been to understand all the instabilities of a plasma and to overcome them—or at least to be reassured that they do not cause too much trouble. For this reason, when the newspapers recently announced that the Princeton Large Torus had achieved a temperature of 60 million degrees, this bare announcement told only a part of the story. The most important part of the story was the fact that this high temperature had been reached without the plasma breaking into one of the many modes of oscillation that might have been

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excited, and without shortening the confinement time of the plasma in the magnetic field.

The equations of a plasma are so complex that such results cannot by predicted in advance with absolute surety. The equations simply cannot be solved exactly. In solving them one usually makes certain simplifications that permit the equations to be handled by mortal humans or by computers—but which omit details that might turn out to be important. Therefore the only way to prove the feasibility of fusion power is to build machines based on the best available theory and then to show that the machines work.

In other words, the theory does not prove that fusion is impossible or impractical. But neither does the theory prove that fusion is feasible. Only experience will tell. In thermonuclear fusion research, the boundary between fantasy and reality is always 20 years from any given date. For this reason my story "Fusion" *(Stellar One,* Ballantine, 1974) consisted of some things that had happened and some things yet to happen.

4. Skyhooks, Beanstalks, and Such.

During the past few years a new idea in space transportation has begun to emerge. Novels by Charles Sheffield and Arthur C. Clarke based on the concept of the skyhook have appeared simultaneously (skyhook or beanstalk, depending on who's talking). In Jerry Pournelle's anthology *The Endless Frontier,* an excellent article by Hans Moravec on "Cable Cars in the Sky," gives a bibliography of past research on the subject.

For imaginative audacity the skyhook deserves the *chutzpa* award of the decade. I bow in admiration.

As always, an idea like this is a challenge to be worried and chewed upon like a bone. I must compulsively begin analyzing its scientific and practical feasibility, using all the tools at my command.

The basic idea of the skyhook is this: put a satellite in synchronous orbit and drop a cable down from the statellite to the earth's surface. As you extend the cable down, its weight would tend to drag the satellite down out of its orbit. This tendency is counteracted by putting the satellite up into a higher orbit, but keeping it moving with synchronous speed, so that it continues to hang above the same spot on the equator.

The synchronous orbit has an important property. At the altitude of that synchronous orbit the gravitational force pulling down is exactly counterbalanced by the centrifugal force pulling outward on

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a satellite revolving with a 24-hour period. If you have a cable hanging down from a satellite sitting above the synchronous orbit, there is a net downward force acting on the part of the cable below the synchronous altitude (36,000 kilometers), while on the part above there is a net upward force. (Fig. 5) When the system is in equilibrium, the upward force balances the downward force. In other words, the weight of the cable is supported by the centrifugal force

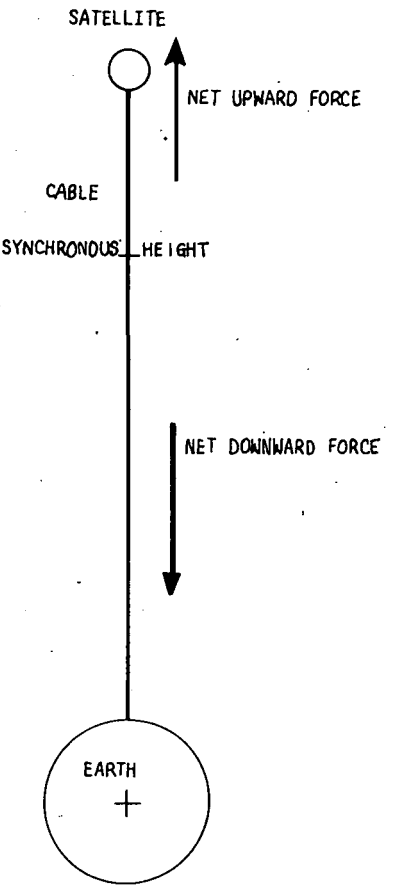

Fig. 5. A tethered satellite acts like a balloon, kept aloft by centrifugal force, since it is higher than the synchronous orbit. Along the cable, the gravitational force is greater than the centrifugal force below the synchronous altitude, while above that altitude the centrifugal force is greater than the gravitational. In equilibrium the forces all add up to zero.

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acting along the cable as well as on the anchoring satellite.

Now, with the cable in place, we can send cars aloft to the anchoring satellite, using it as a launching pad for space vehicles, since escape velocity from that point is relatively small. In fact, the orbital velocity of the anchoring satellite will just equal escape velocity when the cable is is about 47,000 kilometers long, so that the whole affair can be used as a slingshot to cast vehicles into space without the use of rocket boosters. (Note, for comparison, that the radius of the earth is about 6,380 kilometers.)

A glance at that 47,000 kilometer figure raises serious questions. What is the weight of the cable going to be? And how strong must the cable material be if it is going to support its own weight? The weight, of course, will depend on the tensile strength and the density of the material. You can see intuitively that the stronger the material, the smaller the cross-section of the cable needs to be; thus, less weight has to be supported. Use of light-weight material produces the same beneficial result.

Furthermore, the most efficient design tapers the diameter of the cable so that it is broadest at the place where it has to be strongest. Near the earth's surface the cable does not have to be so thick, because a relatively small weight hangs from it. But up at the synchronous altitude, that's where it has to be strongest, for a full 36,000 km of cable hangs from that point. At a higher altitude less strength is needed, because the farther out you go, the more the centrifugal force compensates for the weight of the cable.

An equation that gives the diameter of the cable can be obtained readily by saying that the stress along the cable (the tension per unit cross-sectional area) should be constant at all altitudes. This gives a curious kind of exponential function (see Appendix) that behaves as predicted: the cable is narrow at the point where it anchors into the ground, it widens out and is maximum at the synchronous altitude, and then tapers off gradually as it goes off into space. (Fig. 6)

The amount of taper depends on the tensile strength and specific gravity of the cable material. If you use a good steel with a tensile strength of 100,000 lbs/in^2 and a specific gravity of 8, you find that the diameter at the widest point must be 10^{120} times greater than the diameter at the place where it hooks onto the earth's surface. That's a rather atrocious requirement. The project looks impossible on the face of it.

However, we can get a striking improvement by going to materials with higher tensile strength and lower density. Since these numbers

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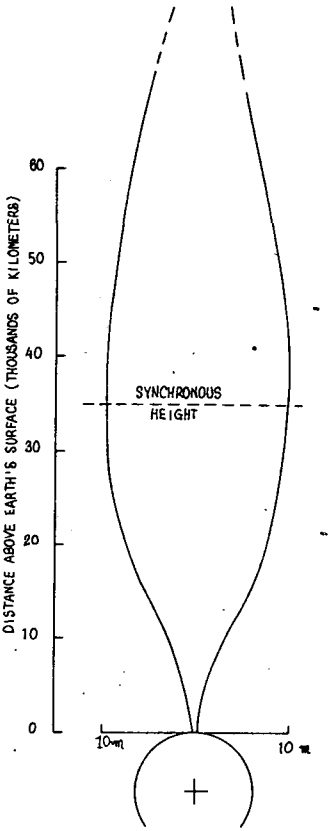

Fig. 6. The shape of a skyhook shaft, assuming constant stress (tension per unit area). The figure is not to scale. The fatness to length ratio is greatly exaggerated.

appear in an exponential function, a relatively small change in parameters produces an enormous change in dimensions. However, in order to get results that are in any sense reasonable, we must look into materials of an exotic nature.

For example, single-crystal whiskers of graphite are said to have a tensile strength of 3 million pounds per square inch. If we allow a safety factor of 2, we put 1.5 million pounds per square inch into the equation, and a specific gravity of 2.25. We then find that the maximum diameter of the cable must be about 200 times greater than its diameter at the earth's surface, a much more reasonable

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requirement than previously encountered. It means that if we start with a cable 10 cm in diameter at the bottom, it expands out to a maximum of 20 meters in diameter at a point 36,000 kilometers above the earth's surface, and then tapers in again as you go farther out.

To avoid spinning the cable out indefinitely, what we have to do is terminate it with a massive anchoring satellite. This satellite must be just big enough so that the centrifugal force acting on it will put the system into equilibrium. For example, if we place the satellite at a height of 50,000 km, it must have a mass of about 8 billion tons. That sounds formidable, but if we consider a sphere of iron (or equivalent) its diameter would have to be only about 1.25 kilometers. Just a small asteroid would do.

Assuming that we can get such a satellite and that we can manufacture single-crystal graphite in sufficient bulk, the next step is to investigate the dynamics of the system. As we have seen, analysis of statics is not enough. We know that this system is in equilibrium. We want to know whether it is stable or unstable. We want to know what happens when the system is in motion.

For example, what happens when a car is sent up the cable? As the car goes out from the surface of the earth, its velocity around the equator must continually increase if it is going to keep up with the rotational motion of the earth. Thus the cable must drag the car around in the direction of the earth's rotation, and conversely the car drags the cable back. By the time the car gets up to the anchoring satellite, the satellite has been slowed down by some amount. (What I have been describing is the coriolis force on the rising elevator.)

Another way of saying the same thing is that the car increases its angular momentum as it climbs up the cable, so that the satellite-cable system must lose an equal amount of angular momentum. The result is that every time a car goes up it reduces the satellite's velocity, so that eventually it no longer has enough speed to stay in orbit and it starts falling to the earth. In other words, the system is unstable if the cable is used as a one-way street to launch vehicles into space. As with all instabilities, the system takes more or less time to collapse. The time for this to happen would depend on the mass of the satellite-cable system. The more massive it is, the longer the collapse takes. But in any event it is an undesirable state of affairs.

The way to avoid this catastrophe, of course, is to have cars running in both directions. We can envision a chain of cars running up

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and down at the same time. The coriolis force from the up cars will be opposite to the coriolis force from the down cars, and so on the average they balance out. The system has been stabilized.

But if you analyze what happens when you have pairs of forces like this running up and down a string, you realize that what we have here is all the ingredients for setting up a standing (transverse) wave.

This, in itself, may not be so terrible. Mainly it is necessary to make sure that the length of the cable is not equal to an integral multiple of the wavelength. That way a resonance is avoided and the amplitude of the wave will stay within limits. At least, that is how it appears qualitatively. There are many fascinating mathematical problems to be worked out concerning the propagation of waves (both transverse and longitudinal) along such a cable. I have gotten part way through some of the equations, but find that without a grant from NSF or NASA, the time involved in working them all the way is becoming prohibitive. While theoretical problems are fun, practicality may force the conclusion that it is not worth spending time on them, because other problems may have a higher priority.

The guiding principle in doing feasibility studies is to find the weak link in the chain. Find the simplest, crudest objection to the scheme. If it won't work for a simple reason, no need to go looking for complicated reasons.

For example, what if the satellite's orbit is not perfectly circular? This would cause a stretching of the cable as it oscillates up and down. You would certainly have to make sure that you don't exceed the elastic limit of the cable material. How much of an oscillation might we expect? After all, we know that a freely floating synchronous satellite will bob up and down over a span of hundreds of kilometers because of perturbations from the sun and moon. Would this bobbing motion put too much of a strain on the cable?

Here we must realize that a tethered satellite will not behave at all like a free satellite. The tension on the cable is a much greater influence on the system than the moon's gravity. All that happens is that the satellite, anchored by its cable, sways slowly back and forth like an inverted pendulum, swinging less than a tenth of a degree each way.

So as far as dynamics are concerned, there are no overpowering instabilities that make the skyhook scheme impossible. We need only overcome the hurdle of finding a material with a usable tensile strengh of 1.5 million lbs/in^2. However, we have not yet answered

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a question that we hinted about previously. How much is the cable going to weigh? How much material is it going to take to build it?

If we calculate the volume and mass of the cable out to a height of 50,000 kilometers above the earth's surface, we find that a mass of 2×10^{13} kilograms of crystalline graphite is required. That's 20 billion tons!

Well, all right. After all, we have to learn how to think big. Think of the men who built the Ringworld, the Dyson sphere! The solar system is full of raw materials for the having.

But graphite? Wherever you get it, it costs something. The current cost of industrial grade graphite is $7 per kilogram. Let's not worry about the price of converting it into single-crystal fibers. At that price the cost of the materials for the skyhook comes to 140 trillion dollars. Is there that much money in the world? The Gross National Product for the United States was a mere 2.3 trillion dollars in 1979.

Fortunately, we can make a vast improvement in the cost of the project by cutting out the safety factor from the tensile strength of the graphite. If we put the full 3 million lbs/in^2 into the equation, we find that the maximum diameter of the cable comes to only 1.4 meters (instead of 20 m), while its mass is now a mere 120 billion kilograms. This results in a cost for raw materials of 840 billion dollars. Surely a manageable sum.

You notice the power of the exponential function rearing its noble head. Strengthening the material by a mere factor of two gives us an improvement of over 100 in the number of kilograms and/or number of dollars required.

The results of all these calculations were considerably surprising to me. I had started out playing Devil's Advocate in my usual curmudgeonly manner, trying to play **Gotcha** with the skyhook inventors, trying to show that the scheme would not work, that it would be unstable. After considerable self-education I found, to my great surprise, that the scheme has a life of its own. It is not so easily knocked out of the ring, regardless of how outrageous its dimensions appear at first glance. All that is needed for its success is a useful material 30 times stronger than good steel, and one-quarter the density.

It also will take a lot of money. But in science fiction, who has ever worried about how much anything was going to cost?

Appendix

The skyhook equation gives the cross-sectional area of the skyhook shaft (or cable) as a function of distance from the center of the

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earth, based on the condition that the stress (the tension per unit area) is constant along the length of the shaft.

Make the following definitions:

D = density of shaft material
  = 2.25×10^3 kg/m^3 (for graphite)
C = tensile strength of material
  = 1.03×10^{10} N/m^2 (equivalent to 1.5×10^6 lbs/in^2)
g = 9.8 m/sec^2
R = earth radius = 6.378×10^6 meters
ω = angular velocity of earth = 7.29×10^{-5} rad/sec
r = distance from center of earth.
A_0 = cross sectional area at surface of earth (r = R).
A = cross sectional area at radius r.
Z = DgR^2/C
W = $D\omega^2/2C$

Then the cable equation is:

$$A = A_0 \exp(Z/R + WR^2) \exp(-Z/r = Wr^2)$$

(Note the use of MKS units, rather than English units. It avoids confusing mass with weight.)

ANSWER TO TITAN'S LOCH METH MONSTER (from page 45)

Call the serpent's length x. The length of each piece is $x/3$. We can now write the equation:

$$x/3 = 10 + x/(2 \times 3).$$

Solving the equation gives x a value of 60 meters.

Unfortunately, this answer presupposes a fact that is not given in the statement of the problem. What is this unjustified assumption, and what is the problem's correct answer when the assumption is not made? See page 92.

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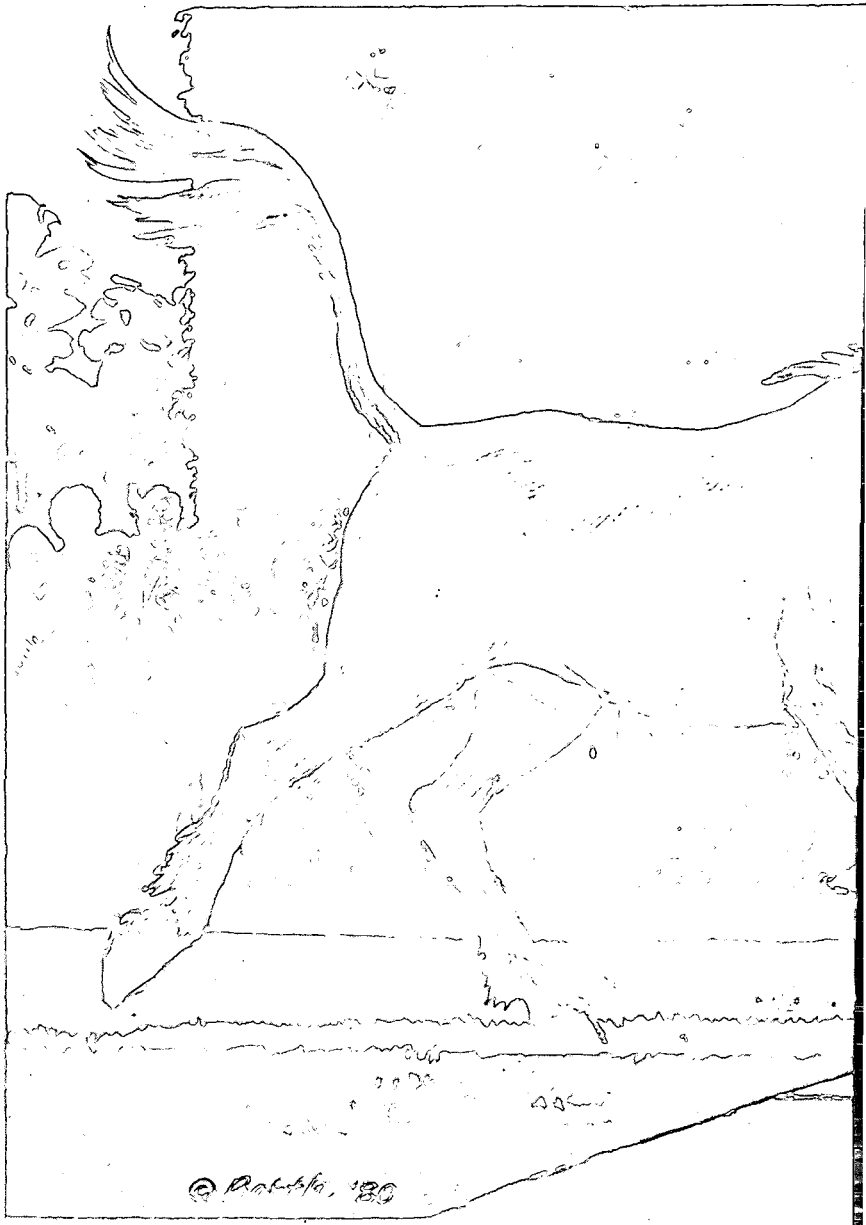

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THE WOMAN THE UNICORN LOVED

by Gene Wolfe

art: Frank Borth

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This is a further adventure of the people we met in "The Woman Who Loved the Centaur Pholus" in the December 1979 issue of this magazine.

At the western edge of the campus the parkway sent a river of steel and rubber roaring out of the heart of the city. Fragrant pines fringed the farther side. The unicorn trotted among them, sometimes concealed, sometimes treading the strip of coarse grass that touched the strip of soiled gravel that touched the concrete. That was where Anderson, looking from his office window, first saw him.

Drivers and passengers saw him too. Some waved; no doubt some shouted, though their shouts could not be heard. Faces pale and faces brown pressed against glass, but no one stopped. Possibly some trucker with a CB informed the police.

The unicorn was so white he gleamed. His head looked Arabian, but his hooves were darkly red, like pigeon's-blood rubies, and his tail was not like a horse's tail at all, but the kind of tail—like the tail of a bull, but with an additional guidon of hair halfway to the tip—that is seen only in heraldic beasts. His horn shone like polished ivory, straight as the blade of a rapier and as long as a man's forearm. Anderson guessed his height at fourteen hands.

He turned away to lift his camera bag down from the top of the filing cabinet, and when he got back to the window the unicorn was in the traffic. Across two hundred yards of campus lawn he could hear the squealing of brakes.

"Pluto, the grisly god, who never spares,
Who feels no mercy, who hears no prayers."

Anderson recited the couplet to himself, and only as he pronounced the word *prayers* was he aware that he had spoken aloud.

Then the unicorn was safe on the other side, cantering across the shaven grass. (Pluto, it appeared, might hear prayers after all.) As the armed head lifted to test the wind, Anderson's telephone rang. He picked it up.

"Hello, Andy? Dumont. Look out your window."

"I am looking," Anderson said.

"Dropped right into our laps. Can you imagine anybody letting something like that go?"

"Yes, pretty easily. I can also imagine it jumping just about any fence on earth. But if we're going to protect it, we'd better get on the job before the kids run it off." Anderson had found his telephoto zoom and coupled it to the camera body. With the phone clamped

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between his shoulder and his ear, he took a quick picture.

"I'm going after it. I want a tissue specimen and a blood sample."

"You can get them when the Army shoots it."

"Listen, Andy, I don't want to see it shot any more than you do. A piece of work like that? I'm going out there now, and I'll appreciate any help I can get. I've already told my secretary to phone some members. If the military comes in—well, at least you'll be able to get some stills to send the TV people. You coming?"

Anderson came, a big, tawny man of almost forty, with a camera hanging from his neck. By the time he was out of the Liberal Arts Building, there were a hundred or so students around the unicorn. He must have menaced them; their line bent backward, then closed again. His gleaming horn was lifted above their heads for a moment, half playful, half triumphant. Anderson used his size and faculty status to elbow his way to the front of the crowd.

The unicorn stood—no, trotted, almost danced—in the center of a circle fifty feet wide, while the students shouted jokes and cheered. A little group who must have known something of his lore grabbed a blonde in a cheerleader's sweater and pushed her forward. He put his head down, a lancer at the charge; and she scampered back into the jeering crowd, breasts bobbing.

Anderson lowered his camera.

"Get it?" a student beside him asked.

"I think so."

A Frisbee sailed by the unicorn's ears, and he shied like a skittish horse. Someone threw it back.

Anderson yelled, "If that animal gets frightened, he's going to hurt somebody."

Dumont heard him, whether the students did or not. He waved from the farther side of the circle, his bald head gleaming. As the unicorn trotted past him, he thrust out a loaf of bread and was ignored.

Anderson sprinted across the circle. The students cheered, and several began running back and forth.

"Hi," Dumont said. "That took guts."

"Not really." Anderson found he was puffing. "I didn't come close. If he was angry, none of us would be here."

"I wish none of them were—nobody but you and me. It would make everything a hell of a lot simpler."

"Don't you have that tranquilizer gun?"

"At home. Our friend there would be long gone by the time I got back with it. Maybe I should keep one in the lab, but you know how

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it is—before this, we've always had to go after them."

Anderson nodded, only half listening as he watched the unicorn.

"We had this bread to feed to mice in a nutrition project. I put some stuff in it to quiet him down. On the spur of the moment, it was the best I could do."

Anderson was wondering who would arrive first—their Mythic Conservationists with protest signs or the soldiers and their guns. "I doubt that it's going to be good enough," he told Dumont.

A young woman slipped between them. "Here," she asked, "can I try?" Before Dumont could object, she took the bread and jogged to the center of the circle, the wind stirring her short, brown hair and the sunlight flashing from her glasses.

The unicorn came toward her slowly, head down.

Dumont said, "He'll kill her."

The students were almost quiet now, whispering. Anderson had to fight the impulse to dash out, to try to hold back the white beast, to knock him off his feet and wrestle him to the ground if he could. Except that he could not; that a dozen like him could not, no more than they could have overthrown an elephant. If he, or anyone here, were to attempt such a thing now, people would surely die.

The young woman thrust out Dumont's loaf—common white bread from some grocery store. After a moment she crouched to bring her eyes on a level with the unicorn's.

Anderson heard himself murmur,

"Behold a pale horse:
And his name that sat on him was Death."

Then, when tension had been drawn so fine that it seemed to him that he must break, *it* broke instead. The ivory lance came up; and the shining, impossible lancer trotted forward, nibbled at the bread, nuzzled the young woman's neck. Still quiet, indeed almost hushed, the students surged forward. A boy with a feathery red beard patted the unicorn's withers, and a girl Anderson recognized from one of his classes buried her face in the flowing mane. The young woman herself, the girl with the bread, stroked the fierce horn. Anderson found that he was there too, his hand on a gleaming flank.

Then the magic blew away beneath the threshing of a helicopter, dissolved like a dream at cockcrow. It came in low across the park, a dark blue gunship. (Police, Anderson thought crazily, police and not the Army this time.) A dozen people yelled, and the students began to scatter.

It banked in a tight turn and came back trailing a white plume of tear gas. Anderson ran with the rest then, hearing the thunder

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of the unicorn's hooves over—no, under—the whicker of the four-bladed prop. There was a sputter of fire from some automatic weapon.

Back in the Liberal Arts Building several hours later, he went to the restroom to wash the traces of the gas from his face and hands and put drops in his faintly burning eyes. The smell of the gas was in his trousers and jacket; they would have to be cleaned. He wished vaguely that he had been prescient enough to keep a change of clothes on campus.

When he opened the door to his office, the young woman was there. Absurdly, she rose when he entered, as though sex roles had not just been eliminated but reversed.

He nodded to her, and she extended her hand. "I'm Julie Coronell, Dr. Anderson."

"It's a pleasure," he said. She might have been quite pretty, he decided, if she were not so thin. And so nervous.

"I—I noticed you out there. With the unicorn. I was the one who fed him bread."

"I know you were," Anderson said. "I noticed you, too. Everyone did."

She actually blushed, something he had not seen in years. "I've some more." She lifted a brown paper sack. "The other wasn't mine, really—I got it from some man there. He's in the Biology Department, I think."

Anderson nodded. "Yes, he is."

"That was white. That bread. This is pumpernickel. I thought he—the unicorn. I thought he might like it better."

Anderson could not keep from grinning at that, and she smiled too.

"Well, anyway, *I* like it better. Do you know the story about the general's horse? Or am I being a pest?"

"Not at all. I'd love to hear the story of the general's horse, especially if it has anything to do with unicorns."

"It doesn't, really. Only with horses, you know, and pumpernickel. The general was one of Napoleon's, I think Bernadotte, and he had a favorite charger named Nicole—we would say Nicholas or Nick. When the Grand Army occupied Germany and the officers ate at the German country inns, they were served the coarse, brown German bread with their meals. All Frenchmen hate it, and none of them would eat it. But the others saw that Bernadotte slipped it into his pockets, and when they asked him about it, he said it was

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for his horse—*Pain pour Nicole*, bread for Nick. After that the others joked about the German 'horse bread,' *pain pour Nicole*, and the Germans thought that was the French name for it, and since anything French has always been very posh on menus, they used it."

Anderson chuckled and shook his head. "Is that what you're going to call him when you find him? Nicholas? Or will it be Nicole?"

"Nick, actually. The story is just folk-etymology, really. But I thought of it, and it seemed to fit. Nick, because we're both Americans now. I was born in New Zealand, and that brings me to one of the things I came to ask you—what nationality are unicorns? I mean originally. Greek?"

"Indian," Anderson told her.

"You're making fun of me."

He shook his head. "Not American Indian, of course. Indian like the tiger. A Roman naturalist called Pliny seems to have begun the story. He said that people in India hunted an animal he called the monoceros. Our word *unicorn* is a translation of that. Both words mean 'one-horned.' "

Julie nodded.

"Pliny said this unicorn had a head like a stag, feet like an elephant, a boar's tail, and the body of a horse. It bellowed, it had one black horn growing from its forehead, and it could not be captured alive."

She stared at him. He stared expressionlessly back, and at last she said, "That's not a unicorn! That's not a unicorn at all. That's a rhinoceros."

"Uh huh. Specifically, it's an Indian rhinoceros. The African ones actually have two horns, one in front of the other. Pliny's description fell into the hands of the scholars of the Dark Ages, who knew nothing about rhinoceroses or even elephants; and the unicorn became a one-horned creature that was otherwise much like a horse. Unicorn horn was supposed to neutralize poisons, but the Indians didn't ship their rhinoceros horns west—China was much closer and much richer, and the Chinese thought rhinoceros horn was an aphrodisiac. Narwhale horns were brought in to satisfy the demand, and narwhale horns succeeded wonderfully, because narwhale horns are so utterly fantastic that no one who hasn't seen one can believe in them. They're ivory, and spiraled, and perfectly straight. You know, of course. You had your hand on one today, only it was growing out of a unicorn's head. Dumont would say out of the head of a genetically re-engineered horse, but I think we both know better."

Julie smiled. "It's wonderful, isn't it? Unicorns are real now."

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"In a way, they were real before. As Chesterton says somewhere, to think of a cow with wings is essentially to have met one. The unicorn symbolized masculine purity—which isn't such a bad thing to symbolize, after all. Unicorns were painted on shields and sewn into flags. A unicorn rampant is the badge of Scotland, just as the bald eagle is the badge of this country, and eventually that unicorn became one of the supporters of the British arms. The image, the idea, has been real for a long time. Now it's tangible."

"And I'm glad. I like it like that. Dr. Anderson, the real reason I came to see you was that a friend told me you were the president of an organization that tries to save these animals."

"Most of them are people. All right if I smoke?" She nodded, and Anderson took a pipe from his desk and began to pack it with tobacco. "Many of the creatures of myth were partly human and had human intelligence—lamias, centaurs, fauns, satyrs, and so forth. Often that seems to appeal to the individuals who do this sort of thing. Then too, human cellular material is the easiest of all for them to get—they can use their own."

"Do you mean that I could make one of these mythical animals if I wanted to? Just go off and do it?"

The telephone rang and Anderson picked it up.

"Hello, Andy?" It was Dumont again.

"Yep," Anderson said.

"It seems to have gotten away."

"Uh huh. Our bunch certainly couldn't find it, and our operator said there was nothing on the police radio."

"Well, it gave them the slip. A student—an undergraduate, but I know him, and he's pretty reliable—just came and told me. He saw it over on the far side of the practice field. He tried to get up close, but it ran behind the field house, and he lost it."

Anderson covered the mouthpiece with his hand and said, "Nick's all right. Someone just saw him." He asked Dumont, "You send a bunch to look for him?"

"Not yet. I wanted to talk to you first. I gave the boy the key to my place and asked him to fetch my tranquilizer gun. He's got my van."

"Fine. Come up here and we'll talk. Leave this student a note so he'll know where you are."

"You don't think we ought to send some people out after the unicorn?"

"We've had searchers out after him for a couple of hours, and so have the police. I don't know about you; but while I was beating the

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bushes, I was wondering just what in the name of Capitoline Jove I was going to do with him if I found him. Try to ride him? Put salt on his tail? We can't do a damn thing until we've got your tranquilizer gun or some other way to control him, and by the time the boy gets back from your house in Brookwood it will be nearly dark."

When he had cradled the telephone, Anderson said, "That should give you an idea of how well organized we are."

Julie shrugged sympathetically.

"In the past, you see, it was always a question of letting the creature get away. The soldiers or the police wanted to kill it, we wanted to see it spared. Usually they head for the most lightly populated area they can find. We should have anticipated that sooner or later we'd be faced with one right here in the city, but I suppose we assumed that in a case like that we'd have no chance at all. Now it turns out that we've got a chance—your friend Nick is surprisingly elusive for such a big beast—and we haven't the least idea of what to do."

"Maybe he was born—do you say born?"

"We usually say created, but it doesn't matter."

"Well, maybe he was created here in the city, and he's trying to find his way out of it."

"A creature that size?" Anderson shook his head. "He's come in from outside, from some sparsely settled rural area, or he'd have been turned in by a nosy neighbor long ago. People can—people do—perform DNA engineering in the city. Sometimes in basements or garages or kitchens, more often on the sly in college labs or some big corporation's research and development facility. They keep the creatures they've made, too; sometimes for years. I've got a seahorse at home in an aquarium, not one of those fish you buy cast in plastic paperweights in the Florida souvenir shops, but a little fellow about ten inches long, with the head and forelegs of a pony and the hindquarters of a trout. I've had him for a year now, and I'll probably have him for another ten. But suppose he were Nick's size—where would I keep him?"

"In a swimming pool, I imagine," Julie said. "In fact, it seems rather a nice idea. Maybe at night you could take him to Lake Michigan and ride him there, in the lake. You could wear scuba gear. I'm not a terribly good swimmer, but I think I'd do it." She smiled at him.

He smiled back. "It does sound like fun, when you describe it."

"Just the same, you think Nick's escaped from some farm—or perhaps an estate. I should think that would be more likely. The

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rich must have these poor, wonderful animals made for them sometimes."

"Sometimes, yes."

"Unicorns. A sea-horse—that's from mythology too, isn't it?"

Anderson was lighting his pipe; the mingled fumes of sulfur and tobacco filled the office. "Balios and Xanthos drew the chariot of Poseidon," he said. "In fact, Poseidon was the god of horses as well as of the sea. His herds were the waves, in a mystic sense few people understand today. The whitecaps were the white manes of his innumerable steeds."

"And you mentioned lamias—those were snake women, weren't they?"

"Yes."

"And centaurs. And fauns and satyrs. Are all the animals like that, that the biologists make, from mythology?"

Anderson shook his head. "Not all of them, no. But let me ask you a question, Ms. Coronell—"

"Call me Julie, please."

"All right, Julie. Now suppose that you were a biologist. In genetic engineering they've reached the stage at which any competent worker with a Master's or a Ph.D.—and a lot of bright undergraduates—can do this sort of thing. What would you make for yourself?"

"I have room for it, and privacy, and lots of money?"

"If you like, yes."

"Then I'd make a unicorn, I think."

"You're impressed with them because you saw a beautiful one today. After that. Suppose you were going to create something else?"

Julie paused, looking pensive. "We talked about riding a sea-horse in the lake. Something with wings, I suppose, that I could ride."

"A bird? A mammal?"

"I don't know. I'd have to think about it."

"If you chose a bird, it would have to be much larger, of course, than a natural bird. You'd also find that it could not maintain the proportions of any of the species whose genetic matter you were using. Its wings would have to be much larger in proportion to its body. Its head would not have to be much bigger than an eagle's—and so on. When you were through and you were spotted sailing among the clouds, the newspapers would probably call your bird a roc, after the one that carried Sinbad."

"I see."

"If you decided on a winged horse instead, it would be Pegasus. I've never yet seen one of those that could actually fly, by the way.

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A winged human being would be an angel, or if it were more bird-like, with claws and tail feathers and so on, perhaps a harpy. You see, it's quite hard to escape from mythological nomenclature, because it covers so much. People have already imagined all these things. It's just that now we—some of us—can make them come true."

Julie smiled nervously. "An alligator! I think I'll choose an alligator with wings. I could make him smarter at the same time."

Anderson puffed out a cloud of smoke. "That's a dragon."

"Wait, I'll—"

The door flew open and Dumont came in. Anderson said, "Here's the man who can tell you about recombinant DNA and that sort of thing. I'd only make a hash of it." He stood. "Julie, may I present Henry A. Dumont of Biology, my good friend and occasionally my rival."

"Friendly rival," Dumont put in.

"Also the treasurer and technical director of our little society. Dumont, this is Julia Coronell, the lady who's hiding the unicorn."

For a moment no one spoke. Julie's face was guarded, expressionless save for tension. Then she said, "How did you know?"

Anderson sat down again, and Dumont took the office's last chair. Anderson said, "You came here because you were concerned about Nick." He paused, and Julie nodded. "But you didn't seem to want to *do* anything. If Nick was running around while the police looked for him, the situation was urgent; but you told me that story about pumpernickel and let me blather on about fauns and centaurs. You were worried, you were under a considerable strain, but you weren't urging me to get busy and reactivate the group we had looking for Nick this afternoon. When Dumont here called, I was very casual about the whole thing and just asked him to come over and talk. You didn't protest, and I decided that you knew where Nick was already. And that he was safe, at least for the time being."

"I see," Julie whispered.

"I don't," Dumont said. "That boy told me he saw the unicorn."

Anderson nodded. "A friend of yours, Julie?"

"Yes . . ."

Dumont said, "Honey, it's nothing to be ashamed of. We're on your side."

"You hid Nick," Anderson continued, "after the police dropped their tear gas. He was tame with you, as we saw earlier. He may even have eaten enough of Dumont's bread to calm him down a bit—there was a sedative in it. For a while after that, you were

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probably too frightened to do anything more; you just lay low. Then the police went away and our search parties gave up, and you went off campus to buy that bread you're holding. On the way back to give it to Nick, you met someone who told you about me."

Dumont asked, "Was it Ed? The boy who told me he saw the unicorn?"

Julie's voice was nearly inaudible. "Yes, it was."

"And between the two of you, you decided it would be smart to start some rumors indicating that Nick was still free and moving in a direction away from the place where you had him hidden." Anderson paused to relight his pipe. "So the first report had him disappearing behind the field house. The next one would have put him even farther away, I suppose. But more or less on impulse, you decided that we might help you, so you came up here to wait for me. Anyway, it would be safer for you to take that bread to Nick after dark. All right, we will help you. At least, we'll try. Where is Nick?"

Ed was no more a boy, actually, than Julie Coronell was a girl—a studious looking young man of nineteen or twenty. He had brought Dumont's tranquilizer gun, and Dumont had it now, though all of them hoped it would not be needed. Julie led the way, with Anderson beside her and Dumont and Ed behind them. A softness as of rose petals was in the evening air.

Anderson said, "I've seen you around the campus, haven't I? Graduate school?"

Julie nodded. "I'm working on my doctorate, and I teach some freshman and sophomore classes. Ed's one of my students. Most of the people I meet seem to think I'm a sophomore or a junior myself. How did you know I wasn't?"

"The way you're dressed. I guessed, actually. You look young, but you also look like a woman who looks younger than she is."

"You ought to have been a detective," she told him.

"Yes, anything but this."

The sun had set behind the trees of the park, trees whose long shadows had all run together now, flooding the lawns and walks with formless night. Most of the windows in the buildings the four passed were dark.

"What department?" Anderson asked when Julie said nothing more.

"English. My dissertation will be on twentieth century American novelists."

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"I should have recognized you, but I'm more than two thousand years behind you."

"I'm easy to overlook."

"Let's hope Nick is too." For a moment, Anderson studied the building looming before them. "Why the library?"

"I've been doing research; they let me have a key. I knew it had just closed, and I couldn't think of anything else." She held up the key.

A minute or two later, it slid into the lock. The interior was dim but not dark—a scattering of lights, lonely and almost spectral, burned in the recesses of the building, as though the spirits of a few geniuses lingered, still awake.

Dumont said, "You'd better let me go in front," and hurried past them with the tranquilizer gun. The doors closed with a hollow boom; suddenly the air seemed stale.

"Isn't there a watchman?" Anderson asked.

Julie nodded. She was near enough for Anderson to smell her faint perfume. "You said Ed was a friend of mine. I don't have a lot, but I suppose Bailey—he's the watchman—is a friend too. I'm the only one who never calls him Beetle. I told you Nick was in the Sloan Fantasy Collection. Have you heard of it?"

"Vaguely. My field is classical literature."

Behind them, Ed said, "That's what fantasy is—classical lit that's still alive. When the people who wrote those stories did it, their books were called fantasy."

"Ed!" Julie protested.

"No," Anderson said. "He's right."

"Anyway," Julie continued, "the Sloan Collection isn't the best in the country, or even a famous collection. But it's a jolly good one. It's got James Branch Cabell in first editions, for example, and a lot of his letters. And there's some wonderful John Gardner material. So that's where I put Nick."

Stamping among the books, Anderson thought to himself. Couchant at the frontiers of Overworld and Oz.

Pity the Unicorn,
Pity the Hippogriff,
Souls that were never born
Out of the land of If!

Somewhere ahead, Dumont called, "*He's dead*!" and suddenly all three of them were running, staggering, stumbling down a dark and narrow corridor, guided by the flame of Dumont's lighter.

Anderson heard Julie whisper, "Nick! Oh, God, Nick!" Then she

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was quiet. The thing on the floor was no white unicorn.

Dumont rasped, "Hasn't anybody got a light?"

"Just matches," Anderson said. He lit one.

Ed told them, "I've got one," and from the pocket of his denim shirt produced a little, disposable pen light.

Julie was bending over the dead man, trying not to step in his blood. There was a great deal of it, and Dumont had stepped in it already, leaving a footprint. Ed played his light upon the dead man's face—cleanshaven; about sixty, Anderson guessed. He had worn a leather windbreaker. There was a hole in it now, a big hole that welled blood.

"It's Bailey," Julie said. And Dumont, thinking that she spoke to him (as perhaps she did), answered, "Is that his name? Everybody called him Beetle."

Bailey had been gored in the middle of the chest, very near the heart, Anderson decided. No doubt he had died instantly, or almost instantly. His face was not peaceful or frightened or anything else; only twisted in the terrible rictus of death. The match burned Anderson's fingers; he shook it and dropped it.

"Nick . . ." Julie whispered. "Nick did this?"

"I'm afraid so," Dumont told her.

She looked around, first at Dumont, then at Anderson. "He's dangerous. . . . I suppose I always knew it, but I didn't like to think about it. We'll have to let the police . . ."

Dumont nodded solemnly.

"Like hell," Anderson said, and Julie stared at him. "You put him here, in this room"—Anderson glanced at the half open door—"and went away and left him. Is that right?"

"Mr. Bailey was with us. He heard us as soon as I brought Nick inside. Nick's hooves made a lot of noise on the terrazzo floor. We took him to this room, and Mr. Bailey locked it for me."

Ed asked, "Hold this, will you, Dr. Dumont?" and handed Dumont the pen light, then took three steps, stooped, and straightened up with a much larger flashlight. After the near darkness, its illumination seemed almost a glare. Dumont let his lighter go out and dropped it into his pocket.

Ed was grinning weakly. "This must be the old man's flash," he said. "I thought I saw something shine over here."

"Yes." Anderson nodded. "He would have had it in his hand. After Julie left he came here to take another look at the unicorn. He opened the door and turned on his flashlight."

Julie shivered. "It could have been me."

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"I doubt it. Even if Nick doesn't have human or almost human intelligence—and I suspect he does—he would have winded the watchman and known it wasn't your smell. No matter what kind of brain his creator gave him, his sensory setup must be basically the one that came with his equine DNA. Am I right, Dumont?"

"Right." The biologist glanced at his wrist. "I wish we had more information about the time Beetle died."

Ed asked, "Can't you tell from the clotting of the blood?"

"Not close enough," Dumont said. "Maybe a forensic technician could, but that's not my field. If this were one of those mysteries on TV, we could tell from the time his watch broke. It didn't, and it's still running. Anybody want to guess how far that unicorn's gone since he did this?"

"I will," Anderson told him. "Not more than about two hundred and fifty feet."

They stared at him.

"The front doors were locked when we came in—Julie had to open them for us. I'd bet the side door is locked too, and this building has practically no windows."

"You mean he's still in here?"

"If he's not, how did he get out?"

Julie said, "We'd hear him, wouldn't we? I told you—his hooves made a racket when I let him in."

"He heard them too," Anderson told her. "He wouldn't have to be a tenth as intelligent as he probably is to keep quiet. Almost any animal will do that by instinct. If it can't run—or doesn't think running's a good idea—it freezes."

Ed cleared his throat. "Dr. Anderson, you said he could tell by the smell that Beetle wasn't Julie. He'll know we aren't Julie too."

"Conversely, he'll know that she is. But if we separate to look for him and the wrong party finds him, there could be trouble."

Dumont nodded. "What do you think we ought to do?"

"To start with, give Ed here the keys to your van so he can bring it around front. If we find Nick, we're going to have to have some way to get him out of town. We'll leave the front doors open—"

"And let him get away?"

"No. But we need unicorn bait, and freedom's about as good a bait as anybody's ever found. Nick's probably hungry by now, and he's almost certainly thirsty. My mind runs to quotations anyway, so how about:

One by one in the moonlight there,
Neighing far off on the haunted air,

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The unicorns come down to the sea'.
Do you know that one?"

All three looked blank.

"It's Conrad Aiken, and of course he never saw a unicorn. But there may be some truth in it—in the feeling of it—just the same. We'll prop the doors wide. Dumont, you hide in the darkest shadow you can find there; the open doors should let in enough light for you to shoot by, particularly since you'll be shooting at a white animal. Julie and I will go through the building, turning on lights and looking for Nick. If we find him and he's docile with her, we can just lead him out and put him in the van. If he runs, you should get him on the way out."

Dumont nodded.

When the two of them were alone, Julie asked, "That gun of Dr. Dumon's won't really hurt Nick, will it?"

"No more than a shot in the arm would hurt you. Less."

The beam of the dead watchman's flashlight probed the corridor, seeming to leave a deeper twilight where it had passed. A few moments before, Anderson had talked of turning on more lights, but thus far they had failed to find the switches. He asked Julie if it were always this dim when she came to do research after the library had closed.

"Bailey used to take care of the lights for me," she said. "But I don't know where. I'd begin setting up my things on one of the tables, my notebooks and so forth; and the lights would come on." Her voice caught on *lights*.

She sniffled, and Anderson realized she was crying. He put his arm about her shoulders.

"Oh, rot! Why is it that one can—can try to do something fine, and have—have it end . . ."

He chanted softly:

"Twist ye, twine ye! Even so,
Mingled shades of joy and woe,
Hope and fear, and peace, and strife,
In the thread of human life."

"That's b–beautiful, but what does it mean? That the good and bad are mixed together so we can't pull them apart?"

"And that this isn't the end. Not for men or women or unicorns. Probably not even for poor old Bailey. Threads are long."

She put her arms about his neck and kissed him, and he was so busy pressing those soft, fragrant lips in return that he hardly heard

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the sudden thunder of the unshod hooves.

He pushed her away just in time. The spiraled horn raked his belly like a talon; the beast's shoulder hit him like a football player's, sending him crashing into a high bookcase.

Julie screamed, "No, Nick! Don't!" and he tried to stand.

The unicorn was rearing to turn in the narrow aisle, tall as a giant on his hind legs. Anderson clawed at the shelves, bringing down an avalanche of books. He found himself somehow grasping the horn, holding on desperately. A hoof struck his thigh like a hammer and he was careening down some dark passage, half carried, half dragged.

Abruptly, there was light ahead. He tried to shout for Dumont to shoot; but he had no breath, grasping the horn, grappling the tossing white head like a bulldogger. If the soft pluff of the gun ever came, it was lost in the clattering hoof-beats, in the roar of the blood in his ears. And if it came, the dart surely missed.

They nearly fell on the steps. Reeling they reached the bottom like kittens tossed from a sack. Anderson managed then to get his right leg under him; and with the unicorn nearly sprawling, he tried to get his left across the broad, white back and found that leg was broken.

He must have shrieked when the ends of splintered bone grated together, and he must have lost his hold. He lay upon his back, on grass, and heard the gallop of approaching death. Saw Death, white as bone.

Stallions fight, he thought. Fight for mares, kicking and biting. Only men kill other men for a woman.

He lay without moving, his left leg twisted like a broken doll's. Stallions don't kill—not if the other lies down, surrenders.

The white head was silhouetted against the twinkling constellations now, the colors seemingly reversed as in a negative, the longsword horn both new and ancient to the sky of Earth.

Later, when he told Julie and Dumont about it, Dumont said, "So he was only a horse after all. He spared you."

"A super horse. A horse armed, with size, strength, grace, and intelligence all augmented." They had wanted to carry him somewhere (he doubted if they themselves knew where), but he had stopped them. Now, after Dumont had phoned for an ambulance, they sat beside him on the grass. His leg hurt terribly.

"Which way did he go? The park again?"

"No, the lake shore. '*The unicorns come down to the sea,*' remem-

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ber? You'll have to drum up a group and go after him in the morning."

Julie said, "I'll come, and I'm sure Ed will too."

Anderson managed to nod. "We've got a couple of dozen others. Some here, some in town. Dumont has the phone numbers."

She forced a smile. "Andy—can I call you Andy? You like poems. Do you recall this one?

The lion and the unicorn
Were fighting for the crown;
The lion beat the unicorn
And sent him out of town.
Some gave them white bread,
And some gave them brown.
Some gave them plum-cake,
And drummed them out of town."

We've just had it come true, all except for that bit about the plum-cake."

"And the lion," Anderson said.

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Artist Profile: Frank Borth

by Elizabeth Mitchell

art: Frank Borth

For a man who didn't realize he was "studying for a career that was the equivalent of manufacturing horse collars," Frank Borth has to admit he's been a successful freelance illustrator.

Borth's pen-and-ink drawings have illustrated many popular *IA'sfm* stories. He brought to life the redmanes Sydney Van Scyoc created for her Brakrath series and has illustrated stories by Barry Longyear, Gene Wolfe, and Roger Zelazny, among many others. *IA'sfm* is only a recent client in Borth's long freelance career, which has lasted more than four decades.

Born in Cleveland on April Fool's Day, 1918 ("nobody ever forgets my birthday"), Borth worked his way through the Cleveland School of Art as a sign painter. He studied fiction illustration—a subject which most art schools don't even offer these days. But it seemed a good career choice at the time, said Borth. Many magazines, notably *The Saturday Evening Post,* then published illustrated fiction. The comic book field was growing tremendously. There appeared to be many opportunities for a willing and talented young artist.

"I wasn't interested in the starving-garret type of thing," Borth says. "I always wanted to be an illustrator. I was always fascinated by people who told stories with their pictures. They seemed like movie stars to me." He admired Harold Von Schmidt and the other *Post* artists and especially Hal Foster, who drew the comic strip "Prince Valiant."

Borth learned his first important lesson about being a successful illustrator while in art school. Assigned to illustrate a historical scene, he spent hours researching a dramatic standoff between a tyrannosaurus Rex and a stegosaurus. "I got books about the vegetation, the terrain, the dinosaurs . . . when it was done, my instructor thought it was good enough to present to the Cleveland Museum of Natural History," Borth said. Breathless with pride, the young illustrator presented his masterpiece to an official at the museum's paleontology department.

"He studied it and complimented me on the effort, and then said, 'Well, there's just one thing wrong. These particular dinosaurs lived about thirty million years apart.'

"I felt utterly defeated, but it gave me a lesson I've always cherished," Borth said. "No matter how well I had painted this, it was

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worthless because it wasn't accurate."

Finished with art school, the 22-year-old took his ambitions to New York City, home of the magazine business. His portfolio earned him work in the comic book field, inking "Submariner," "Human Torch," and other strips after more established artists had penciled the drawings. Borth admits he was frustrated at first by not having full control over the strips he worked on. It's a situation many young artists, unless they are blessed with a strongly individualistic and recognizable style, may have to confront.

"You go through a stage at first when the people in the position of buying are not familiar with your work, and they tell you they'd like something like what 'so-and-so' does," Borth says. "So you find yourself imitating somebody else. It's a frustrating kind of thing."

Borth proved himself a capable inker and eventually created his

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own strip, "Spider Widow," which he wrote as well as illustrated. More advances were on the horizon when an interruption drew him away from New York City. It was called World War II.

Borth was drafted, but because of poor eyesight spent most of his stint preparing charts, booklets, and other basic training aids in Indiantown Gap, Pennsylvania. One poster he designed, said Borth, insured that none of the recruits who saw it would ever forget the properties of poisonous phosgene gas.

"It was a Playboy-type pinup of a girl who had nothing on but a gas mask," he says, chuckling. "The poster said, 'Miss Phosgene. Needs no protective clothing.' "

After the war ended, Borth found himself temporarily at loose ends. One day he saw an advertisement in *American Artist* magazine. The publishers of *Treasure Chest,* a comic book distributed to Catholic school systems nationwide, were seeking an illustrator. Borth applied, got the job—and held it for the next 25 years.

The Treasure Chest publications (which are no longer in existence) were what Borth terms "good comic books." They presented historical tales and contemporary fiction with strong moral points and a Catholic slant. Borth remembers fondly some of the characters he invented for the magazines, which were geared to readers in their early teens. One of his favorites was "The Champ," a good-hearted fat kid "who was klutzy at everything except floating in water." And Borth created Treasure Chest's first heroine—a little girl who won a baby elephant in a contest and then had to figure out how to keep it. Treasure Chest readers loved it and clamored for more stories with female characters.

About ten years ago, Borth became involved in another successful cartooning venture. He is writer and layout man for the cartoon feature "There Oughta Be A Law," which is syndicated daily in 50 newspapers nationwide. The strip is drawn by Warren Whipple.

Borth says he doesn't read much science fiction for pleasure, but enjoys illustrating it very much. "You never know what is going to be asked of you. I hate to be pigeonholed into being asked to draw the same type of thing all the time." One of his favorite subjects is animals. "I think too many artists seem to think of the weird animals of SF as monsters," he says. "They're just creatures." He enjoys using watercolors, oils, and acrylics; but his favorite tools are pen and ink. "The black-and-white line is the basic drawing line, and you've got to be right when you use it."

It's a special trick of the illustrator's trade to plant questions in the reader's mind, says Borth. "When somebody opens the magazine

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and they come to my illustration, I want it to make them read that story. That's my main objective." An additional challenge, he says, is to create a drawing that remains honest to both the story and the reader.

In all honesty, says Borth, he would not recommend freelance illustrating as a career. "It eliminates commuting, and that's about the only good thing about it." But he offers this advice to would-be artists: "As an illustrator, you must be accurate. You need to educate yourself about your subject. For almost any story you have to do research. If you're drawing a locomotive, you have to know how the drive rods work."

Borth lives with his wife, Barbara, a schoolteacher, in Montauk, Long Island. The couple has two grown children, Steven and Kathy, as well as a large dog (Niki), and a headstrong tomcat (Reggie). Borth's spare-time activities include deep-sea fishing, riding his very old horse or his very new tractor, and taking care of his two-acre ranch.

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SECOND ANSWER TO TITAN'S LOCH METH MONSTER (from page 69)

The unjustified assumption is that the two parallel slices of the serpent were perpendicular to the serpent's head-to-tail axis. We have no way of knowing if this was the case. All we are told is that Winetree's cuts were parallel. For all we know they could have been at any angle to the serpent's axis, the angle varying from zero to ninety degrees.

If the angle were zero, the cuts would be parallel to the monster's sides, and each piece would then be as long as the serpent itself. Thus the correct answer to the problem is that the serpent's length could be any value from 20 to 60 meters inclusive. (I want to thank Max Muller, of Cleveland, for sending this amusing switch on an old brain teaser.)

What about the weight of Titan's Loch Meth monster? Let's take weight to mean its weight on earth as expressed in pounds.

An ancient arithmetic riddle says that if a brick weighs a pound plus half its own weight, how much does the brick weigh? Many people carelessly answer 1½ pounds without realizing that this is logically contradictory. First they assume the brick weighs a pound, then they conclude that it weighs a pound and a half. Clearly the only consistent interpretation of the question's wording is that the brick's weight is the sum of one pound and half its own weight. One pound obviously is the "other half." Therefore the brick weighs two pounds.

See how quickly you can answer the following four questions about the serpent. How much does it weigh if its weight is:

1: 1,000 pounds plus half its own weight?
2: 1,000 pounds minus half its own weight?
3: 1,000 pounds times half its own weight?
4: 1,000 pounds divided by half its own weight?

If you remember your elementary algebra you should have no difficulty with any of the appropriate simple equations. If you do, the answers are on page 166.

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BITCH ON THE BULL RUN

by Sharon Webb

art: Alex Schomburg

Mrs. Webb's book on real-life nursing,
When Do I Get to Feel Like a Nurse?,
will be out soon from Zebra Books.

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Satellite Hospital Outpost
Taurus 14, North Horn 978675644
Nath Orbit
July 17

Carmelita O'Hare-Mbotu RN
Teton Medical Center
Jackson Hole Summation City
Wyoming 306548760 United Earth, Sol

Dear Carmie,

Oh, I'm happy here. You needn't worry about me. *I really am happy*. My third favorite thing is to be a member of the Interstellar Nurses' Corps, sealed in an orbiting tin can, doomed to wander the Bull Run until my hitch is up.

My second favorite thing is to walk on hot coals barefoot.

But, my most favorite thing of all is to stand helplessly by while my beloved is lured by the tinsel charms of Marcia Ludgate M.D.

It was our first extended leave—two glorious weeks on Arandar. Beautiful Dr. Brian-Scott and I looked forward with innocent anticipation to a time of simple joy. Carmie, do you have any notion of what it is to have your simple joy disintegrate before your eyes? Can you imagine how cruel it is to view your beloved as a victim of an unscrupulous woman's carnal desire?

Oh, Carmie, it's true.

At first, Arandar was idyllic. We spent our days hiking in the mountains. (I can see your eyebrow raise, Carmie. It doesn't mean what you think it does. "Hiking" is a very old term and it means to walk. Really.) Although it sounds odd, it was fun.

In fact the whole trip was fun until last night. Then came the festive for all the Bull Runners. Some were on leave like Dr. Brian-Scott and me, others were mustering out of the corps, and *others* were just coming on for a new tour of duty.

The place was crowded. I mean it was *dense*. Believe me, it would have been easier for a rich man to pass through the eye of a camel (to coin a phrase) than to pass through the middle of that crowd.

And Marcia Ludgate M.D. was right in the center.

It was really vulgar, Carmie. There she was, surrounded by every human male within light-years. She really had them fooled. You could tell, because every one of them acted like she was the most gorgeous, graceful, beautiful, and intelligent girl in the galaxy.

And right next to her in the *press* of the crowd stood my beloved, staring at her with the silliest look on his face you ever saw. He

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was leering at the bodice of her purple slinky and he was clinging to her hand like his had suction cups.

Then he saw me and he said, "Terra, I want you to meet my colleague, Dr. Marcia Ludgate." When we were introduced, Marcia Ludgate M.D. looked down her nose at me and smiled a pinched little V of a smile. Then she flapped her eyelashes at Dr. Brian-Scott and moved her upper body so that parts of her virtually oozed out of her purple slinky.

I had on my white semi-lace swirl. I always liked it before, but next to her I looked like a Girl Galactic at her first festive.

Oh Carmie, what am I to do? Marcia Ludgate M.D. is going back to Satellite Hospital Outpost with us. She's going to be permanently stationed there. She said she was going to *love* working with Dr. Brian-Scott and that she had lots of new techniques to show him.

I could die.

Yours in despair,
Terra

P.S. Marcia Ludgate M.D. buys her clothes at Frederick's of Hyades. Isn't that shocking?

Terra

Satellite Hospital Outpost
Taurus 14, North Horn 978675644
Nath Orbit
July 18

Frederick's of Hyades
Barebelle Heights
Hyades IV 000333321

Dear Frederick,

Please rush the following order:

1 pr. Pink Velvo Scampies (size medium)
3 pr. skinties (assorted colors, size medium)
3 pr. lumers (one size fits all)
1 set Lurolex scoopers.
1 fluffolex enhancer (perfidious pink, size small)
1 set bluffies (size small) in Galactic Black
1 breezer in Universe Yellow
1 medium red shift.

Anxiously yours,
Terra Tarkington

P.S. About the slilk gapper (as advertised). Does it come with something to wear underneath?

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Satellite Hospital Outpost
Taurus 14, North Horn 978675644
Nath Orbit
July 21

Carmelita O'Hare-Mbotu RN
Teton Medical Center
Jackson Hole Summation City
Wyoming 306548760 United Earth, Sol

Dear Carmie,

I hate Marcia Ludgate M.D. And I hate her pet, too. His name is Hamlet. He's a Pleiadean chat with fur the color of a black hole and a personality to match. He likes Dr. Brian-Scott, but he unhinges his claws and cackles in an awful way whenever I'm close.

When he does that, Marcia Ludgate M.D. clucks her tongue and says, "Now, Hamlet, don't be cruel to our little Terra."

And then my beloved smiles in a vague way and pats my hand like I was six years old or something.

And now, Marcia Ludgate M.D. has sequestered my beloved away in the lab. They're supposed to be working on a vaccine for that new strain of Lethal Lethargy that's been infecting the Aurigan Queens.

They've been in there for hours. It excoriates my soul to think of beautiful Dr. Brian-Scott exposed to that woman.

But, it's not as if I had *time* to grieve. Oh no. The wards are full of Aurigan Queens with the Lethal Lethargy. And you talk about short-handed—Carmie, we are down to nubs. The Aurigan Queens are huge and need lots of care, but they don't want anybody but Hyadeans and humans to nurse them. They're terribly prejudiced against the Aldeberans. They even insulted Dr. Qotemire—and he's Chief of Staff.

One of the Queens huffed at a very sweet Aldeberan nurse just this morning. She called her "vermin derf" and other worse obscenities until the poor nurse was nearly beside herself; she rocked back and forth on her tail and her scales stood on *end*. I've never seen anyone so blue before.

I think it's dreadful. Poor Mrs. Qotlqeer can't help it if she looks like an Aurigan dragon.

Of course, I must be the voice of reason. *Somebody* has to see both sides. And I suppose the Aurigan Queen has a point. If I were suffering from the Lethal Lethargy, I guess I wouldn't want somebody taking care of me who looked like an ancestral enemy.

Well, the Aurigan Queen glared at Mrs. Qotlqeer and called her

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"Egg-eater," and flopped around on her megabed. The Queen got so upset, venom dripped from her lips as fast as I could vacuum it.

And then Mrs. Qotlqeer forgot herself and *hissed.*

It was an awful scene. And now, orders have come down from Dr. Qotemire that no Aldeberan is to take care of a Queen. That's going to mean double shifts for all the rest of us, Carmie, just as sure as death and Texas.

I'll be working myself into an early grave (to coin a phrase) while my beloved is corrupted by Marcia Ludgate M.D.

Yours in horrid abnegation,
Terra

P.S. You won't believe what just happened, Carmie. I ran into Marcia Ludgate M.D. in the hall. She stroked her Pleiadean chat and purred at me and said to Hamlet, "Poor little Terra. She's been crying."

Well, that was a vicious lie. I wasn't crying at all. I had just washed my face and it was still wet. And if my nose was red it was because I had scrubbed it hard.

And then she drew up her mouth in that pinched little V and said to Hamlet, "Maybe she ought to order a love potion from the Aldeberan herbalists. She's going to need it."

And I drew myself up and looked at her and said, "I would sooner die."

Yours in dignity,
Terra

Satellite Hospital Outpost
Taurus 14, North Horn 978675644
Nath Orbit
July 22

Aldeberan Herbalists Inc.
Great Green Patch
Single 888222567 Aldeberan I

Dear Honorable Herbalist:

Please rush me a package of your Love Potion (large economy size).

This is an emergency.

Hurriedly yours,
Terra Tarkington

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Satellite Hospital Outpost
Taurus 14, North Horn 978675644
Nath Orbit
July 24

Carmelita O'Hare-Mbotu RN
Teton Medical Center
Jackson Hole Summation City
Wyoming 306548760 United Earth, Sol

Dear Carmie,

I ordered some new clothes and they came today. But, I haven't even had a chance to try them on. I am exhausted. The Lethal Lethargy is rampant and I am seeing giant Aurigan Queens in my sleep (what little sleep I've had).

Lethal Lethargy is an awful disease. It's caused by a mutated virus and it attacks the mature Queens. The virus causes a hormone to be released which puts an end to the egg-laying cycle. Then the hormone levels go up even higher. After a period of agitation, the Queen goes into a coma. If there is anything worse than an agitated Queen, it's one in a coma. It took me, five Hyadean IVs and a hydraulic lift to get a new admission into her megabed today. It's really very sad, though. Her husbands lined up to see her and one of them told me it would be the end of their race if a cure wasn't found. Then he shuffled all his feet in an embarrassed way and said, "You won't let any dragons come near her, will you?"

I said, "The Aldeberans aren't dragons."

And he said, "Oh, yes they are." He told me that ages ago a colony of Aldeberans of the degenerate Sqotelire sect landed there. "The Aldeberan leaders deny it to this day. But it's true." Then he lowered his flaps and said, "They eat flesh, you know—and *eggs*."

It was awful listening to him. I kept looking at the Aurigan Queen and trying to imagine how an Aldeberan (or anything else for that matter) could want to eat one.

I finally got away from him and went to lunch. We had plankton loaf and sprouts and the loaf spraddled out over the plate like a Queen on a megabed. I couldn't eat a bite.

Dyspeptically yrs,
Terra

P.S. If I cared, I'd tell you what happened after lunch. But I don't care. I am above all petty jealousies.

Terra

P.P.S. Oh, Carmie, that's a lie. I do care. I do. I went by the lab.

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Well, I had to be down that way anyhow, and when I went by, I heard beautiful Dr. Brian-Scott and Marcia Ludgate M.D. behind the closed door. And they were laughing.

No. Not laughing. It was worse. They were giggling.

That was hours ago and they haven't come out yet.

My heart is breaking.

Yours in cheerless gloom,
Terra

Satellite Hospital Outpost
Taurus 14, North Horn 978675644
Nath Orbit
July 25

Carmelita O'Hare-Mbotu RN
Teton Medical Center
Jackson Hole Summation City
Wyoming 306548760 United Earth, Sol

Dear Carmie,

I am poisoned and under siege. I am sure to die soon. I never thought it would end this way. Dr. Qotemire has gone mad. He's outside my door now. He thinks I think he has gone away, but I can hear the scales on his tail scraping over the floor.

Here I am in my hour of need without my beloved to comfort me. And now I'm breaking out in hives.

Oh, Carmie, I didn't mean to poison the Aurigan Queens and madden Dr. Qotemire. What am I to do?

I was trying to get Dr. Brian-Scott out of the clutches of Marcia Ludgate M.D. I didn't mean any harm. It's all because of the Aldeberan love potion. When it came, I put on my new yellow breezer (with the bluffies underneath). I poured a triple dose of love potion into the smoker and lit it. Then I sent an urgent message to Dr. Brian-Scott.

Well, how was I to know that the smoke from the potion would get into the ship's ventilation system?

Borgdo, one of the Hyadean orderlies came to the door with a message from my beloved. He said that Dr. Brian-Scott couldn't come because of an emergency—smoke had blown through the wards and all the Aurigan Queens were having convulsions.

The next thing I knew, Dr. Qotemire came down the hall, slashing his tail back and forth. His eyes were wild and yellow and his scales quivered. I never saw an Aldeberan in such a state.

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When he got to my door, he rolled his eyes in a deranged way and gave a low drawn-out hiss that curdled my blood.

Then he leered at me and said, "Ex-s-s-s-ci-ting!"

I didn't know what he had in mind until he shouted, "S-s-s-s-sex!" and began to chase me around the room.

I screamed. And then I ran—all the while begging Dr. Qotemire to control himself—but it wasn't any use.

I ran out into the hall and he came after me. He cornered me in an alcove. It was awful, Carmie. There I was—trapped. My doom was sealed. He moved toward me and then he stopped. He began to quiver in a sort of dreadful ecstasy, and the scales on his chest began to slap up and down. He seemed almost hypnotized.

When that happened, I got past him and ran back into my room and locked the door.

Now he's outside.

And my hives are getting worse. Besides that, I think I'm going to be sick to my stomach.

Yours in an awful fix,
Terra

P.S. I was very sick just now. I took off my yellow breezer (and the bluffies) and put on my flannelite dowdy. I am in bed now—here to await my fate. It is only a matter of time before they come to prosecute me for poisoning the Aurigan Queens.

I don't think I'll live that long.

Yours in extremis,
Terra

Satellite Hospital Outpost
Taurus 14, North Horn 978675644
Nath Orbit
July 26

Carmelita O'Hare-Mbotu RN
Teton Medical Center
Jackson Hole Summation City
Wyoming 306548760 United Earth, Sol

Dear Carmie,

I am cured.

My beloved came to me as I lay on my bed of pain. There was a look of inexpressible sorrow on his face. "Oh, Terra," he said, "I just found out what happened to you."

Then he gave me something for my hives and sick stomach.

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I had to know: "Are they going to arrest me now?"

Do you know what he said, Carmie? He told me that because of me, the Aurigan Queens were better. Those weren't convulsions they were having at all; they were beginning to lay their eggs again.

I could hardly believe it.

He said it was because of the love potion. It was a love potion all right, but not for humans; it was an Aldeberan sex pheromone. The pheromone set up a reaction in the Aurigan Queens that's something like the human "flight or fight" reaction, only for Aurigan Queens, it was "lay or spray." It's a defense they developed to cope with menace (which is how they view the Aldeberans because of the egg-eating dragons). The Queens' bodies respond by either laying lots of eggs to make up for the ones that are going to be eaten, or they spray venom all over the attacker.

It was because of the pheromone that Dr. Qotemire went mad. But, he is all right now, and horribly embarrassed. All my sympathies are with Mrs. Qotemire, though, considering what she has to go through when Dr. Qotemire is aroused.

And then, Dr. Brian-Scott told me how he found out about the love potion. He had been working in the lab when the smoke began to come through the ducts. When Marcia Ludgate M.D. smelled it, she recognized the odor and she said, "I told her to order it. And she was fool enough to do it." Then she began to laugh.

When I heard that, I wanted to die. I scrunched up in the bed and covered my face.

Well, do you know what my beloved said then? He said, "I told Marcia I thought that was the meanest trick anyone could do, and that I especially resented her doing it to you."

Then he said that she was leaving. Because of the love potion fumes, her pet chat Hamlet got agitated and bit her on the nose. Dr. Qotemire is sending her to Hyades IV to have some reconstructive work done. And after that, she's not coming back.

Isn't that too bad, Carmie?

Then, even with my malaise, I felt better with my beloved there until I realized what I looked like. I was covered with hives and I was wearing that awful flannelite dowdy. All of a sudden I began to cry. I couldn't help it.

And Dr. Brian-Scott looked at me and said, "What's the matter, Terra?"

And I said, "I wanted to be wearing my new clothes when you saw me. I wanted to be pretty."

And then do you know what he did? He kissed me and then he

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said, (I remember his every word) "Terra, I would love you if you weren't wearing anything at all."

Isn't that touching, Carmie?

Yours for being touched,
Terra

DIRECTIONS FOR KILLING THE AUTOMATED HOUSE

So first we sought lobotomy on the dishwasher,
no easy task, what with toxic steam cycle,
laser dry, and ready-made projectiles.
Poor Charlie bought it from a flying collander.
The freezer was easier, not knowing his own mind.
We laid him on his back, until he'd coughed
quite out of ice cubes. Cruelly,
we stuffed the toasters and mixers
into Mother Oven, turned her high
and insane; she self-immolated
in the face of what she'd done.
The electric dog we kept;
it gets lonely in the field.

But it was the neurotic bed, finally,
who gave us fits. Crazed and lonely
from programmed sex, juiced
on Bond movies, he laid an oil slick
to take out our first patrol.
Crazy Larry went in as a couch,
guns blazing. I flanked him
as a rather cute mahogany end table.
The air filled with flying metal,
smoke, and feathers.
When the bed finally coughed, wheezed,
and expired, a strange silence
filled the white frame house.
Somewhere a doorbell,
now a telephone, then a radio,
sadly began to sing.

—Steve Rasnic Tem

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IMPROBABLE BESTIARY: The Yeti

Behold the bashful Yeti, the Himalayan Yeti,
Abominable Snowman in his mountaintop retreat.
The Yeti feels no passion
For current vogue or fashion:
He sports no Gucci loafers on his size eleven feet.

The Yeti always mutinies
When faced with public scrutinies;
You'll seldom see him sitting in the pub and sipping ale.
Reporters from the *London News*
And television camera crews
(Who hope he'll grant them interviews)
Inevitably fail.

Behold the bashful Yeti, the misanthropic Yeti,
Elusive and reclusive and a trifle shy is he.
Don't send him invitations
For social recreations;
He seldom comes to banquets, and he *never* comes to tea!

The Yeti is so timid, he
Won't come into proximity
Of science expeditions when they shout at him and wave.
The Yeti has no wish to stay
And chat with humans such as they,
He'd really rather run away
And hide inside a cave.

So if you see a Yeti—a shy, retiring Yeti—
Just smile and keep on walking; that's the proper thing to do.
Don't call him names or tease him
Or do things that displease him;
You really wouldn't like it if a Yeti bothered *you!*

—F. Gwynplaine MacIntyre

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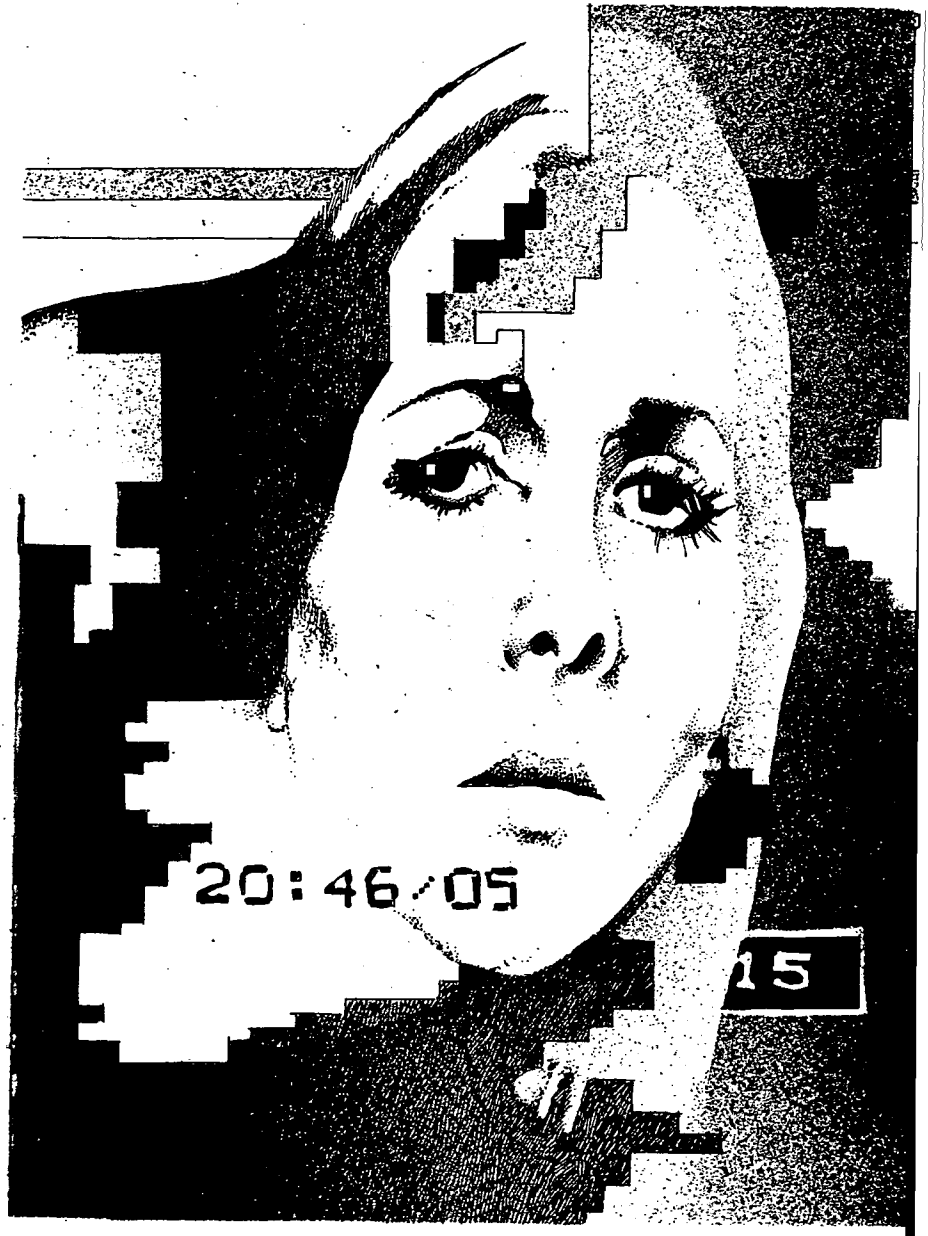

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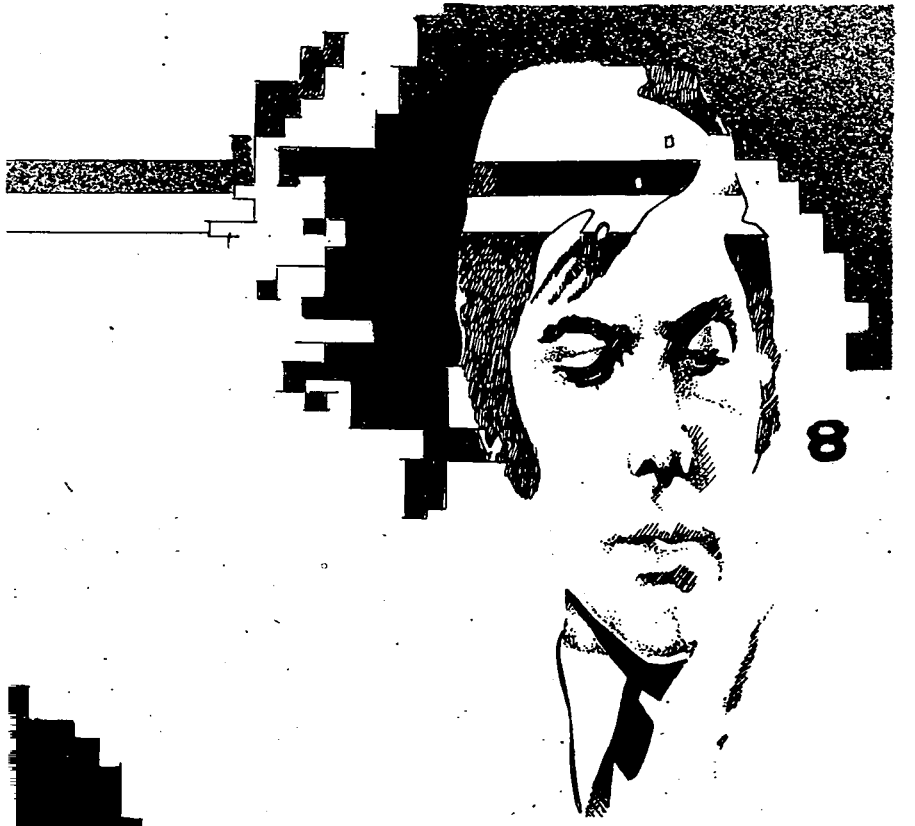

SPEAKING[10] TO OTHERS[2]; SPEAKING[3] TO OTHERS[20]

by Leigh Kennedy

art: Artifact

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The author was born in the small mountain community of Denver, Colorado, and lived there until it became a big city. Last year, she moved to the village of Austin, Texas, where she joined an entire tribe of SF writers. She says *she collects giraffes, loves opera, and takes lots of photos of her friends.*

Sometimes brilliant people are suspected of jealousy. Especially when a newly sparkling young prodigy arrives in a whirlwind of promise.

I was not jealous of Sheldon Bernstein. Eager, energetic, awed by me, he regarded me with bright eyes and stammered. "I've read all your work, Dr. Verez, and it's always been an inspiration," he said. It sounded rehearsed, and when his script ran out he went no further.

We stood in the rather grim and dank library of the Institute for Cassiopeian Studies—books splattered open upon student-carved tables of the donated campus, frustratingly ancient film readers hunched over creaky chairs, windows cranked open to let Bolivian breezes flutter the notices tacked on the board.

"You haven't read *all*," I said, tapping the folder that I held in the crook of my arm, and smiled.

Our Administrative Director, Dr. Trujillo, stood beside the dark, wiry-haired young man and gazed about with a proprietary air, though he was more at home in his world of business than in the research plant.

"Naomi, did you know that besides his work in linguistics, Shel has a undergraduate degree in astronomy?"

"Of course—you told me that." I knew that I sounded irritated, but with Dr. Trujillo, not with Shel. A letter-perfect memory creates impatience with reiteration. At that time, I couldn't have been happier to have an assistant; the Institute employed social, physical, and biological scientists in an effort to comprehend the vast quantity of material the Cassiopeians had communicated to us—the same thing the Cassiopeians were doing with the material we had given them.

One could call it a cultural exchange, but between two cultures who created a new stubbornness in the word "alien." Their cognitive processes, speech patterns, and scientific method proved so strange to us that the meager communication had taken years to exceed mathematical language and "Greetings!"

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"Shall we have tea?" I asked, noting that my rather sharp reply to Trujillo had made him frown. Shel looked a bit depressed—a common feeling when one finds ordinariness reeking from the physical appearance of the Institute. It looked like any poorly funded liberal arts college.

As we walked the yellow corridor toward the cafeteria, Shel loped next to me, his too-long, too-thin legs without any hope of grace. The type: nose in a book rather than debauching with fattening vices in the evening; spending money on journals rather than even moderately stylish clothes; meditating upon his peculiar vision of the galaxy rather than tucking in the tail of his shirt or combing his hair properly. Awkward, but aggressively intelligent.

I have more vanity; I felt small and tidy next to him.

"What is the paper you're working on now?" he asked.

"Ah, yes." Inevitably, having a junior researcher would lead to more discussion of works-in-progress. "The Cassiopeians obviously have a different approach to scientific method than experimentation by sensory observation alone. Even their theoretical mathematics use some unknown methods of proof—and we'd always assumed that math would be universal. But they can't explain to us because they don't know what is different. Conversely, we can't see why they don't understand our physics."

"That's the entire thrust of the Institute's work," Shel said impatiently, letting me know that I had revealed nothing new. Then, uncertainly, as if he'd remembered his role as novice, he asked, "Isn't it?"

"Yes." I sighed. How I hate to articulate my ideas! Printed words create clarity. The spoken phrases can be jumbled, hesitant, misunderstood, lost by distraction and never retrieved. "Perhaps I can explain it when we've worked together more."

"Now, don't hold out on him, Naomi," Trujillo said, laughing a public relations laugh. "The Institute is a common pool, not a stepping stone to the Nobel."

Great God, how that man could irritate me! Platitudes about scientific research dropping like beans into a widow's pot—and without the vinegar of personality they created as much flatulence. "Perhaps it's *you* I don't want to discuss it with," I said.

"Hmm. What do I know?" Trujillo said.

"Exactly." And I laughed, seeing Trujillo smile placidly as though it were pleasant to be teased. It had occurred to me before that though he always pointed out his role with a deserved amount of satisfaction, he seemed to enjoy socializing with scholars as though

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that enhanced his own capabilities.

When we sat down to coffee, Sheldon and I traded life histories, though he knew much of my academic record already.

He was, as I had suspected, a scientist from birth, later discovering a fascination with words and interpretation. I had started in the liberal arts myself. Later, I'd felt the lack of Renaissance breadth in my knowledge and broken into a general study of the sciences. Classifiable as either linguist or scientist, my position at the Institute was established less by specific talent than flexibility, hard work, and devotion to understanding our new-found galactic neighbors.

Perhaps I seem defensive and proud; perhaps I seem aloof and more dedicated to Cassiopeia than personal life. This I say because somehow no one can reconcile what they appear to be with what they really are. When offered an opinion upon my character, I usually cover my ears rather than be influenced by others' inaccurate perceptions of my self.

But this aside, the road was clear for an amicable working relationship with Shel Bernstein.

I am an organized worker. This never seemed so clear as the first day Shel worked with me in the library. My Cassiopeian printout was folded on a clipboard and propped up with books. To my left, a stack of clean paper, several colored pens, and the ever-present coffee cup: to my right lay my "dictionary" of Cass which I had the computer revise every time the spaces filled with addenda.

Sheldon sat in a bewildering confusion of papers and books. Every few moments, he rustled the printout, folding and unfolding it across his table, sighing, rubbing his hand alternately through his hair and on his knee. Occasionally, he would jot something on a piece of paper. He would regard it, then either push it aside or crumple it noisily and try to toss the wad into the wastebasket from across the room. These discards usually lay around the basket until he got up to gaze out the window or refill his coffee cup.

It occurred to me that Shel may have thought that all this commotion was a sign of creative genius—that understanding would come to him in a blinding flash of *satori,* if he played the role of rumpled scholar. Some have said that my way is that of the plodder, but I see it as persistence down various paths of inquiry. There is more value to concentration than gesturing for the descent of knowledge from an unconfirmed Muse.

"Naomi," he said.

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I looked up at him as soon I'd finished the sentence I was writing.

"I think this word is 'difficult,' and not 'solid.' See here. . . ." He came at me, paper in hand, and pointed the phrase out. "Do you see how that fits here?"

I read his copy, recalling exactly where I'd first made the translation. "That appears with a concrete adjective," I said, hoping that would make it clear to him.

"But this author—the one Garrett nicknamed 'Ethel'—always mixes her adjectives. Always one concrete, one abstract, and always two. Garrett said she overwrote, too." He grinned.

"How do you know about Garrett?" I asked. Garrett had resigned two years previously.

"I've read all the Institute's monthly summaries."

"*All* of them?" I asked. That was a tough statement for one who had only gained access a few days ago.

"Yeah. Anyway, I'm going to change the entry in the dictionary."

"Wait a minute, young man," I said. "I will make a note of it and research it before any changes are made."

And that was the first time I saw Sheldon's sullen look. "May I ask," he said in a rather haughty way, "if you think I'm right?"

"I'll look into it," I said, refolding my printout.

"But . . . do you think—off the top of your head—that I may be right?" He leaned over my table.

"I don't work off the top of my head," I said. "But you *could* be right."

"That's all I wanted to know," he said. "Thank you."

He was right after all, I decided later, but I slipped the correction into the computer quietly. He had to realize that this was work, not ego satisfaction.

"What's that you're working on?" Shel asked, sitting down, breathing heavily as if he'd been running.

I looked up from a page of Cassiopeian poetry that I had translated—roughly—my mind still a haze of confusion over several segments. Was it a color? Seemed more of a relationship than an attribute. . . . The poetry, probably a drama-song, vibrated in Cassiopeian, but translated, it struggled like amateur writing by an abstruse Hegelian poorly translated from a Hindi dialect. I felt that I understood the Cass better—though I understood it not at all.

"Mm," I said, and pushed the scratch paper across the table at him.

Lunchtime. I opened the paper bag sitting on the chair next to

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me and pulled out a chicken thigh. "Want a date?"

"What?" He looked at me, startled.

I opened a container of dates, rolled in raw coconut.

"Sure." He ate absently, reading. "This doesn't make any sense."

"Of course it does."

"No, it doesn't."

"That's only because you're an Earthman, son," I said, drinking punch.

He gave me a venomous glance, then rose from the table. "I suppose you understand it," he said, then left abruptly.

I listened to his footsteps padding down the corridor, little unspoken "uh-oh's" dancing on my tongue.

He will learn, I thought, and shrugged.

Nothing is ever as one expects from afar. I saw it in Shel's face one day as he sat outside on a hard lump of grass, leaning against the brick building, staring gloomily into the dramatic Andes. The assurance of rain moved forward with bright metallic-looking clouds on the mild day upon the *altiplano*.

"Taking a rest?" I asked, breathing deep the highland breezes that the Incas had tasted in another, nearly alien time.

"Yeah," he said in a dispirited way. He looked up at me. "I need it already."

"You'll catch on," I said, standing beside him, but watching with fascination the storm that moved like an enormous grey ship across an upside-down sea.

He continued to sit against the building without moving, absorbing the last minutes of bright sun. The quiet between us grew too long. I knew very little how to fill it with pat advice or possibly overly optimistic comfort. "Well, I'll see you."

"Yeah," he said.

Of course it disturbed me, but if he wasn't ready for it, what could I do?

The universe vibrates.

Sometimes it is a grand waltz; sometimes a heartbeat; sometimes the leap of electrons from valence shells. Rhythm is dancing and singing to us; subsonics and ultrasonics we speak of but can't perceive.

The Cassiopeians make no references at all in their literature or texts to the sense of taste. However, they understand rhythm, waves, and vibration with a subtlety and variation that awes me. It reminds

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me of interesting stories of linguistic differences, such as American Indians and their words for colors which even painters cannot imagine.

The universe vibrates . . .

. . . especially to Cassiopeian senses, or probably more specifically to one of their sensory apparati.

"Naomi, what the hell. . . ." Henri of Biochem said. (He's such a wonderful human that I've always felt he deserved a title as noble as Catherine of Aragon.) I admit it was likely to be annoying to have me hanging over his experiment, but all in the interest of research. Besides, I could have annoyed Deelia, but Henri of Biochem appeals to me more.

"Sorry. But let me see . . . what's the problem?"

"Duplication of this basic proposition about sugars. I *think* it's about sugars," he said, pouring a beaker of skim-milkish fluid down a stained sink. The biochemistry lab is less pristine than the other labs, partly because of the recklessness of the students who had inhabited the place before we took over. It is stained with dyes, scorched by errant Bunsens, etched with acids, cluttered with 'scopes, centrifuges, racks of chipped bottles and beakers. Always smelled something like a pickled cat (with fur) and fermented orange juice.

The smell is in the walls, the floor, the sinks. The housekeeping people once heard Henri joke that it was haunted by a freshman who flunked her anatomy lab and committed suicide. They believed him, so besides avoiding clean-up after hours, they left totems around to ward off the unhappy spirit.

"It doesn't make any sense," Henri said, looking over his notes.

"Let me see." I read his formulae. "Where's the Cass?"

"I don't know." Henri cut a stack of printout, twice, like a Tarot deck, and began leafing. "Why?"

"A hunch."

Sheldon wandered in, sniffed a bit as though he found the same rankness about the lab that I did, and withdrew one hand from his pants pocket to pat Henri on the shoulder. "How's it going?"

Henri muttered in French, shaking his head. "How goes it with you?"

Shel nodded with a long-necked bob. "Pretty good. Look at this." From his flanneled armpit he drew a rolled-up manuscript and flung it toward the counter.

"Watch. . . ." I said sharply, and moved something which I had

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guessed to be from a starch test weeks ago, but in fact was stray potatoes *au gratin*. Henri ate lunch on the job, too.

I wiped my hand.

"Ready to publish already?" Henri said, smiling.

"I think so."

"What's that, Shel?" I asked, having heard nothing of it.

"You may read it, too, if you like." For the first time since he'd entered, he looked at me. He appeared a little weary. I guessed that to be due to his current passion for one of the lab assistants, who unfortunately was in turn enamored of a medical student at the University from the States.

Henri skimmed it. I guessed that he read the first sentence of every paragraph, feeling obliged to read but not study.

"Interesting," he said, "but out of my field." He pulled an apologetic face.

"I'd like to see it," I said. I held out my hand and Henri passed it over.

Shel leaned against the counter and acquired a damp line across his shirt above the belt but seemed not to notice. "You know, I really admire what you do here, Henri," he said, patting the biochemist's shoulder again. "We just play with words, but you're in here, risking life and limb. . . ."

They laughed together. "I am performing very elementary science. I can't always make it work, though." He frowned, chewing the end of his index finger. "Naomi, I am going to look for the Cass. Will return." And he walked through the adjoining lab.

"Uh . . ." I said, looking at Shel. Shel didn't look at me. "Uhmmm. I think you've paraphrased me and I don't see . . ." I flipped to the last page of his paper. ". . . don't see any mention here."

"What part?"

"About the verbs in space flight."

"That's not original."

"For you," I said tersely. I hated being like that, but it irked me to work hard and not get the little credit that institutional researchers sometimes receive.

Shel glanced at me, then looked out beyond as if contemplating the wondrous shelf of acids on the wall above my stool. "It's obvious to anyone what you wrote in that paper. I didn't think something so obvious needed credit. It's like quoting the poet who first wrote that the sky is blue."

I handed the paper to him, hoping he wouldn't notice that my hand trembled with anger, hoping instead that he saw the look

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which I felt burned out of my face. "Indulge that poet, huh? We just saw the sky a matter of a few years ago."

He didn't reply for Henri had returned, flourishing the Cass text above his head triumphantly. Still somewhat shaken by Shel's attitude toward my work, I probably seemed a little abrupt when I took it. *"I've read all your work, Dr. Verez, and it's always been an inspiration."* Bright, eager eyes. Gradual disillusionment with the glamour of the Institute, surprise at the tediousness of the work. What I had at first taken for the period of adjustment seemed more of a personality flaw. Arrogance mixed with uncertainty. Hunger for a different flavor of satisfaction from his work than most of the rest of us felt.

Shel Bernstein now disgusted me a bit.

"This is wrong," I said, comparing the original with the translation. "This word which was interpreted as 'stir' is about a sixth-degree hum."

Henri of Biochem looked blank. "*Hum* it?"

"You know," Shel said, chuckling, "bring a few jars and I'll hum it."

"Ha, ha," I said. "And I doubt that you will ever understand the results of this experiment anyway. Too bad. I'm sure the feel of sugar crystallizing is quite lovely."

I gathered up the original and started out of the lab. Shel lunged into my wake. "Let me see what you're talking about."

Henri was watching my face. I know he saw the hesitation I felt. What could I say? Would I deny the bond of understanding between two alien races over a bruised ego? He was brilliant, no doubt; but truly, I wanted nothing to do with him at that moment. I longed for the days only last month when my work involved everyone generally and no one especially.

"Certainly," I said, "come on."

He followed me into the library where we acted out an incredibly polite partnership.

"Trujillo, I think we've got a little problem here."

I could see the word light his face. He must have been thinking something like: "A Problem! And she's come to me—must be a Crucial Decision that will decide the Fate of the Institute. It will take my Administrative Brain to figure it out or she would have gone to Winona. A Problem the Scientists can't figure out!"

He pulled his earlobe and frowned seriously, but his eyes danced. "Sit down, Naomi."

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I sat down and saw Shel's paper on his desk. I had considered all the ways to approach him—casually in the corridor? Indignantly? But the calm, confiding method worked best with Trujillo. He could be conspiratorial at times.

"Bernstein comes to the edge of . . ." No. Don't accuse. "I think that we need to remind Shel to document his research."

Trujillo looked expectantly at me. He didn't understand the significance of my complaint. And then I thought that maybe I *should* have taken this to Winona, the Sciences Coordinator, but she and I didn't always see things the same way.

"Did you tell him that?" Trujillo asked.

"Yes. Three days ago. Look here." I flipped through the pages. "This is mine. This entire paragraph. And this. . . ."

"Don't you use each other's research all the time?"

"Yes, but we give credit to the person who did the work and the thinking." I looked at his face, trying to see if he understood at all what I was trying to say. "Didn't you have to do research papers in college and graduate school?"

He made a face, but seemed pleased that I'd found a parallel in our lives.

"Yeah, but I always did projects, Naomi. Couldn't stand the library stuff, so I always went out and did projects and wrote about them."

"Well, how would you feel if someone used your project and didn't say it was yours exactly?"

Trujillo grinned, almost boyishly. "If anyone had thought they were worth stealing. . . ." He shrugged.

"Oh, crap." I said it aloud and knew I shouldn't have. He looked a little embarrassed.

"Naomi," he said suddenly, now with a father-voice. "Why don't you and Shel get along? He's such a promising lad."

A more succinct word I left unsaid until I was walking out the door.

How many words do we have for vibration? Pulse, beat, quiver, quaver, flicker, bob, undulate, wave, rock, swing, and sway. . . . My first task was to fit each of these words into categories and match Cassiopeian words, then grade our translations with supernumaries.

Example: What had carelessly been translated as, "Parah followed the song that drifted west," became, "Parah rode a wave[15] (as in a gentle lake) that pulsed[10] (nearly twice the magnitude of a human heartbeat) to a direction at right angles to polar vibration[1]."

But it seems so dull and incomprehensible translated so! The Cas-

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siopeian has a dignity that can't be annotated.

Charlotte, Stanislav, and Rudolfo re-examined the alien physiological data for the sensory organ I knew *had* to be there. They've decided that it's a general sense, like our sense of touch. Almost intuitive? The fact that our neurobiology is difficult even to us should indicate that this will be hard to sort out.

There's little value in science and research for false modesty. I feel that I have made a major breakthrough in understanding between races, admittedly only one of many that others will eventually make, but one so pervasive, so subtle that the aliens never would have thought to outline it for us. They may not even realize that they have the ability. Perhaps it is in their higher philosophies—is thought itself discussed in our own mathematics or basic biology? Who would know upon first meeting that the primary manipulative species of Earth *thinks?* That may sound cynical, but one must learn to assume nothing.

That week we sent a message to the Cassiopeians that we lacked something that seemed integral to their concrete view of reality. Though they wouldn't receive the message for several years, it could help them make their own advances.

I began to get a lot of attention. Calls would come in all day to have reinterpretation of methods and/or results. Sometimes I would send Shel, as he could handle the less complicated work.

Shel apparently resented the secondary position. During this time, he rarely spoke to me. When he'd done his best to figure a problem out and failed, he would leave me a note rather than speak to me about it.

I also edited his paper for the Institute's monthly summary, adding credit where credit was due, and striking out a few rather aggressive suppositions that he'd made. All this was at Trujillo's request; it was not any bloodthirsty desire on my part to humiliate him.

He read my emendations silently and would not have commented unless I'd asked him what he thought.

"You took out my unifying statements," he said, still looking at the title page.

"You will learn that you must be cautious about saying things that have little or no actual support," I said, feeling rather like a schoolteacher. "You notice I also added about six footnotes."

"Yeah," he said absently.

"Do you know why?"

He looked at me directly. "I remember Dr. Trujillo saying that the

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Institute was for research, not researchers."

"This involves more than ego, Shel—"

"Excuse me," he said, and turned his back on me.

During this period of inspired activity at work, I used to take long walks after work, usually carrying my groceries from the town up the road to my house, then—after leaving off the food—continuing on to ramble the outskirts of town until nearly dusk. One evening I was working out a difficult passage in my head while strolling—listening to the sand under my feet crunch[7], the wind rustling[3] the grass, and measuring the world in my perception of Cassiopeian terms.

I heard steps behind me. I didn't turn to look, but at the same moment that I hesitated, the footfalls ceased. As I continued, the steps receded.

When I finally turned, Shel's awkward ambling in the fresh blue twilight was unmistakable.

I never knew his intentions, whether the proximity was accidental, or whether he'd sought me out and changed his mind. But the sight of him outside the Institute, going away without even a terse word of greeting, brought an oddly sad feeling to me.

Wouldn't it have been nice if. . . .

Oh, one mustn't spend one's life wishing that things had been different.

We avoided one another. Sometimes I saw a look on his face from across the room—as if he'd been wounded. And that enraged me. It was *my* work; was I supposed to carry him around under my arm and say, "This is my assistant. Give him credit." No. He knew how to take care of himself. I even saw him eating lunch with Winona, the Sciences Coordinator, several times.

He wrote his second paper again without consulting me at all. I found out about it from Trujillo. He came shouting after me in the computer room, the crowded and hot nerve center of the Institute, where at any moment there are at least twenty people from different departments.

"Naomi!" Trujillo shouted. "We're sending this one out."

I didn't know what he was talking about. Occasionally individual reports would be released for publication in journals. At that particular time I had no new writing, so I couldn't imagine why he was shouting at me so.

"What's that?"

"Bernstein's latest. He's such a clear writer, so entertaining, that

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we've decided to submit this one as a general interest piece."

"Oh?" I took it from him and began to read. As I've mentioned, I've worked hard in many fields, a flexible partner to anyone who needed me. Probably unbeknownst to Shel, the recently deceased Epi had enlisted me a great deal in the project that Shel wrote about. He'd written up a paper dealing with Cassiopeian descriptions of their tidal forces, planetary and moon libration. It *would* have worked well in a popular astronomy magazine, but he paraphrased Epi extensively. At least there was a footnote this time, but one could assume that much of the original research was Sheldon Bernstein's, when in fact it was Epi Gold's.

I looked up at Trujillo. "The kid's nearly a plagiarist."

"What!" The word exploded out of insulted lips.

I have to admit that I was embarrassed; if I'd know that Shel had stepped beside me, I would have phrased the idea in a less direct manner.

"You jealous bitch!" he said loudly.

Computers are not loud beings—they whirr softly, sometimes tick and whine a bit. Only they spoke into the room where many human beings stood silently.

"This is Epi's unpublished work, too," I said. In the periphery I noticed Henri of Biochem standing at full attention, a wad of printouts in his hands. That caused me a twinge of grief. "I . . ."

"You've been on my back from the day I got here!" Shel said, barely able to control his childishly emotional rage. Sweat moistened his red face. His awkwardness seemed ever more young and painful.

"Shel, I . . ."

"Not any more! I can't stand it! I'm—"

Dr. Trujillo gripped Shel's shoulder. "Don't say another word. Come with me." He led him away out the door. As they walked down the corridor, I could see Trujillo patting Shel's back, alternating headshakes and nods.

Still embarrassed, I realized that I held the paper in my hand. Frustration: Trujillo and others admired this gifted lad. He would believe everything Shel said. My position at the Institute was, of course, too valuable to be jeopardized. Nevertheless things could be made unpleasant in small ways. I could be forced to take vacations, or be "volunteered" to a lecture circuit long enough to fall behind in the small day-to-day discoveries that created the larger whole of the Institute's work.

I threw the paper upon the floor.

Henri made himself an obstruction in the doorway. "Naomi, I will

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speak to you."

"I've done nothing wrong!" I said, knowing that this was too sharp a voice to use to Henri. "He's seeking glory. He's used my work—and others'—as if . . ." I stopped speaking when Henri took my hands in gentle friendship.

"You should have guided him like a teacher. He probably doesn't know the sensitivities of publishing. He's used to term papers for professors."

"I'm not a teacher. And I told him . . . I told him." I will not further agonize over the details of my anger.

"Naomi," Henri said, "how will we learn to communicate with aliens if we can't speak to each other?" He touched my chin affectionately. "Do you know what I'm remembering? About five years ago, a young and horribly annoying woman who used to go around redoing everyone's work . . . until we took her aside and carefully told her to mind her own business. Do you remember?"

"Oh . . ."

That memory had gotten put aside. It would have been far more painful to think that Henri thought of it clearly if he hadn't been studying me with such a fond smile.

"And now, rather than annoying us, our Naomi is an inspiration."

Fortunately, I escaped his company before I embarrassed myself further with an uncontrolled emotional indulgence.

I have never been the effusive, warm sort. My generosities arise out of genuine affection for an individual, not a general magnanimity. I suppose . . . yes, I suppose Shel committed no hideous crime. But neither did he do right. I could have been gentle, taken him under my wing, tenderly guided him. But that is not my way—never will be. But, believe me, I did repent of my hasty public accusation and apologized to him in the cafeteria with a dozen or so witnesses.

He thanked me. That was all.

The next time I saw him, he entered the library quietly, as if not to disturb me. I worked upon something I had assumed was a simple historical piece. Though written in epigrams, the meanings were difficult. It was apparently more of a philosophical treatise. Even in Cassiopeian I could barely follow the feel of the structure as I whispered it, much less understand what it offered.

Alien. Very alien.

"Hello," I said. I watched him remove his notebook from the glassed-in cupboard.

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"Hello."

The greetings sounded unnatural, but it's something we must do. He glanced around as if searching for another personal possession.

"Your coffee mug?" I asked, pointing to it on the window ledge.

"Thanks." He crossed the room and sat down cross-legged upon one of the tables. "I'm going to write a book about the Institute. A non-technical book."

"Yes, I heard." I turned my chair slightly with a bump and, leaning my arm across the back, regarded him. "That should be fun for you."

"Yeah." He tapped his knee restlessly and squinted as if his contact lenses had slipped. "Well . . . Naomi, I'm sorry."

I only nodded. I felt suddenly that it was almost as hard to accept an apology as to give it. Was he sincere? Was this something Trujillo told him he should perform for the internal harmony of the Institute? Was this the end of our troubles? I remembered his curt thank you and that made me smile.

I turned my chair back and reread the translation I'd just made. For a long moment, I thought of Henri of Biochem.

In what I thought was a very lighthearted and natural voice, I said, "What do you think of this?"

He sat down across from me and said, "Hmmm[4]," and we got some work done.

PAVLOV'S CAT

Initially,
she'd had to claw the paneled door
and yowl,
to drag him from those slack-jawed dogs;
she only wanted out.
But he learned fast.
In weeks, a month perhaps,
she'd but to brush his leg,
and—laying pad and bell aside—
he'd stand and fumble for the latch.

—Don Anderson

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Trial Sample

by Jed Reynolds

art: Jim Kirk

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Mr. Reynolds recently sent us what can only be described as a potpourri. This story, however, is not a part of it.

Paul hated sleeptime worse than anything, even meals. His head swam with dizziness, his biceps ached abominably, and his hip-joints felt on the verge of parting. He couldn't even balance his weight with his hands, as the family were still in halfsleep; if they opened their eyes and saw him clutching the sleeping bar, it would hardly bode well for trade and diplomatic prospects.

He'd just have to hold out for another half-hour till the others had entered deepsleep; then he could clamber down from the perch and spread out on the rocky cave floor for a couple of hours. Just as long as he was back suspended from the sleeping bar by his knees when the family woke up.

Sure enough, Pommop opened one eye and looked at Paul lazily. "We got the Morks corraled just fine, didn't we, son?"

"Sure, Pamma," squeaked Paul, strumming his translation voder in affection mode.

Pommop closed his eye contentedly and remained swinging slowly back and forth, head downwards on his own bar.

Halfsleep was always an oscillating time with the Shecklites, entering and leaving. A fair amount of conversation went on, an almost mindless recapitulation of the past day's activities, forecasts of the coming one, and general expressions of mutual esteem and satisfaction.

Now Yoouwee, hanging on the far side of the cave, rustled his (and/or) her batlike wings, muttering somnolently, "Did I tell you today that you're a great sibling, Wayuueo? One of the best."

"You, too, Yoouwee," answered Paul, trying to sound asleep.

There was a short spell of silence. Paul decided it was his turn. "Mappa? Can we have Kabisco for mornmeal tomorrow? I just love your Kabisco." He detested it.

"Mmmmmmm," drowsed Moppom. It sounded gratefully like she, or perhaps he, at least, was nearing deepsleep.

Gradually the talk died away, and the family faded into deepsleep. Paul waited in agony until he was sure they were all quite beyond rewaking. Then he reached up to clutch the perch, painfully brought his legs out from over the sleeping bar, and let himself down to the floor of the cave. Every muscle ached, and he was exhausted. He stretched out his limbs one at a time, working the kinks out of them.

If only sleeping on the floor were an acceptably deviant form of

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behavior among the Shecklites, Paul wouldn't mind being thought strange. But in the minds of the family, a member who refused to sleep in a properly inverted manner from the sleeping bar would be showing signs of incipient madness, possibly of a homicidal variety. With the best will in the world, such a tendency in one of their children must raise strong instinctive anxiety. After the first few nights on Sheckley, Paul had realized this was one of the activities too close to the border of social acceptance to indulge in.

Paul moved wearily to the far end of the cave, where the Mestoiwe family kept its ancestral altars and computer linkups. He lay down on the floor, straddling as few rocks as possible. He'd have about three and a half hours of sleep before the family rose to midsleep again. They'd better find him swinging from his perch, cozy and content, or there'd be diplomatic trouble.

Paul hated sleeptime with a passion!

And now, to top it all, he couldn't get to sleep at once. His mind kept casting up the same old futile question: *Why me?* With four and a half billion humans to choose from, why couldn't the lottery have fallen on someone else; anyone else? He'd like to see his wife, Marilyn, handle this, for instance.

Not for the first time, he cursed the dumb way the Galactic races had of arranging inter-species relationships. Surely humans could have worked out a less ridiculous method. But when Earth joined the Galactic community, the scheme had been a set tradition for millions of years; man could join it, or retreat home and sulk, but there was no changing or circumventing it.

Paul knew the technique was necessary. Species across the Galaxy were too diverse, too varied, to expect each of them to get along with all the others. Some were baby-eaters, some held very firm religious convictions. Each new species that entered Earth's purview was a potential diplomatic ally, trade partner, friend—or perhaps far too different, physically, mentally, socially, morally, for humans ever to get along with.

The lottery was the established way to make or break relationships. Paul knew, intellectually, that it made more sense than wars, for example. But for someone forced to carry it out in a given instance, it sure seemed dumb.

The human representative on the planet Sheckley sank into an uneasy doze.

The family squatted on the ledge outside the cave mouth, shuffling tine-loads of morkmeat into their mouths. Paul could be grate-

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ful Moppom hadn't come up with the Kabisco, but mork wasn't much more appetizing.

The sky arched pale yellow overhead, flecked by bilious green cloudlets, the corralled Morks shuffled and boomed softly from their pens upslope, and the birdlets flittered busily across the morning sun. Pommop came stretching out of the cave mouth and stood looking out over Kooluuwe Ravine. Ponderously he shook out his delicately ribbed wings and then his long limbs, rubbing the sleep out of them.

"Beautiful day, a really gorgeous day," he said at last, joining the family at their mornmeal. "Isn't it your turn to flap over to Youoory for eggs, Wayuu?" He beamed affectionately at Paul.

A bit of underdone mork caught in Paul's throat and he coughed helplessly. From where he sat, on the rim of the cliff, he could see the tops of the higher planted houses poking over the flametrees. A mere half mile as the bat flies, he thought. Two hours climbing for me, first down and then up. If I make it.

I'm not *one of you,* he thought desperately at the squatting family. *I don't have wings, I can't fly, I* hate *breeir eggs. You know that, why do you pretend?*

It was no use. They were letting Paul know that he was one of them, that they still accepted him. He should feel relieved and flattered. If they ever started coddling him, then he could really start to worry. It was just that all the members of the Mestoiwe family took their turns in shopping at Youoory village, and now it was his turn. As simple as that.

"Sure, Pamma," he squeaked as expected, his fingers racing over the voder keys. "Oh, boy. Can I stay to see a flooel show?" He couldn't abide the local entertainment, but the original Wayuueo, who loved flooel animations, would certainly have asked. Besides, it would give an easily accepted excuse for the extended time he would have to be gone from the family homestead.

"Well, now . . ." drew out Pommop, in his standard role of not-coddling-the-kids, but Moppom broke in at that point. "I don't see any harm in that, Poms. Wayuu's been a good boy for a long time now. He never molts in the cave," she added approvingly. "Not like Yoouwee."

"I'll start right away, then," said Paul, leaping to his feet in haste.

"You sit right down and finish your mork," said Pommop sternly. "No child of mine is going to visit the village in a vitiated condition. What would the olders think?"

"It's not my fault," said Moppom. "That child just picks at his food.

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I swear, sometimes I don't know what's wrong with him. It must be the mildew itch."

Finally the mornmeal ordeal was over. The family all bid him safe day, Pommop passed him some cash (the dried iridescent underwings of the rock scarab), and then they all assiduously turned to praise the colors of the morning sky to one another. That way they wouldn't have to take notice of the highly unorthodox mode of his departure. When they were all looking upwards, Paul gaily cried out, "Wings up; off, off, and away!" and quietly clambered over the edge of the precipice.

As he cautiously descended from one handhold to another, Paul found himself muttering, "Twenty-seven days of Hell to go, twenty-seven days of Hell. If one of those days should happen to fall . . ."

He stopped humming. He didn't like to think about falling. It was still a long way to the bottom.

Actually, by Earth count it was only twelve days to go, with four hundred twenty passed. Sheckley days were short, though standard galactic years were much too long. It was one of those years he had to hold out.

If he did fall and get killed, would relationships between Earth and Sheckley be established anyway, he wondered. If the Shecklites returned his body to Earth, he supposed not; if they buried him in the family plot and mourned it as one of their own, then everything would be all right. Assuming the real Wayuueo, in his place on Earth, also made out all right.

The walls of the ravine rose higher above him as he descended into the depths. He tried to concentrate on finding firm grasps, and ignoring the sweat that rolled down his neck and soaked the back of his jumper. "I'll bet the real Wayuueo isn't having as much trouble as this," he decided bitterly. A series of rapid visions passed before him; Wayuueo flying to the plant in the morning, working the assembly line, drinking beer at Rod's Grill after work, playing touch football with Paul's sons. Surely he wouldn't find any of that too irksome.

Paul wondered if Wayuueo had to sleep in the same bed with Marilyn. After Paul's wife was asleep, Wayuueo probably crept out of bed and hung upside down from the coat-rack. Paul felt an abrupt surge of sympathy for his distant counterpart.

Finally he reached the bottom of the crevice. Far overhead, the narrow sliver of warm lemon sky beamed down upon him. The hollow was full of tangled mockbush and wildweed and cracklethorn; down

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it ran Kooluuwe Creek, twenty yards across, three deep, and full of mangleworms. He had to plunge through the bushes downstream ten minutes before he found a fallen flametree that bridged the creek.

The fallen log was thick enough, but slippery with oozing sap, and Paul had to inch his way across it sitting down. Half way across it, he came upon a rogerian. The lizard lay lethargically half out of the water, its long tail streaming in the rapid current. Its tongue flicked meditatively as Paul approached.

"Care to tell me about your problem?" said the rogerian.

"I doubt you'd be any help," said Paul.

"Oh, you doubt I'd be any help?" said the rogerian. "Why is that?"

"Because," answered Paul caustically, "you have about as much intelligence as a tree toad, and you don't understand a word you are saying." He had reached the point where the lizard squatted, and remained straddling the log, waiting for the creature to move.

The rogerian lizard blinked sleepy eyes and regarded Paul steadily. "Is it because I have about as much intelligence as a tree toad, or because I do not understand a word I am saying, that you doubt I would be of any help?" it asked.

"Oh, lord, not another therapy session," said Paul. He drew up his right leg and began to massage the knots out of it. "Your so-called conversation is nothing but a series of evolved tropisms, an eidetic memory and mimic ability. It looks clever, but there's not a thought in your alligator head."

"How do you see this as tying in with your problem?" asked the rogerian.

Paul paused in the midst of switching legs. "You know, that's a good question. If it weren't for you empathic lizards, the pressure on me to hold out the full year wouldn't be nearly so great. Earth dearly wants to be able to import shiploads of you. You may not have an intelligent thought of your own, but you certainly help people solve their own problems. Now move aside."

"Don't you think I could help you solve your own problem?"

Sometimes it was hard to realize that it was a mere tropism.

"No," said Paul.

"Aren't you being a bit negative?"

Paul groaned. "Look, Elijah, or whatever your name is, my problems aren't psychological, they're *real*. If I can't put up with the Shecklites for a full standard year . . . or if they can't put up with me, and kick me out . . . then my name back on Earth is mud. There was a Hungarian a few years back who blew the whole Quatrary

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exchange within a week of the end of the period, when he refused to impregnate a nubile Quatrary prawn. The Quatrary were vastly disturbed at his dereliction, and expelled him. So now the Quatrarian mungo mines and the sciences of Uxode are closed to humans forever; we will never be able to deal with the Quatrary race. And that man was a social leper on Earth till he blew his brains out last year. I don't want to end up like that!"

"You don't want to end up like that?" the lizard suggested quietly.

"You're damn right I don't. But I also don't want to end up like that Ruwandan who clinched the relation with the Humdingers by serving out his whole term to perfection . . . and then died right after of acute radiation poisoning. He's a human hero now, but he's just as dead . . . a martyr to human desire for Humding microfabrics and the electromagnetic dramas of Cliklick! All I want is to get out of here—" Paul broke off suddenly, drew his legs high out of the water, and said, "I think you should consider your own problem first. There's a mangleworm working his way upstream behind you."

"We were discussing you, not me. What does the mangleworm working his way upstream behind me suggest about your prob——"

Paul sighed and continued along the fallen trunk, carefully keeping his legs well out of the water until he was past the point where small fragments of rogerian spun on the current. *Less* intelligent than a tree toad, he decided. Still, a pleasant break in an otherwise tedious day.

He reached the opposite edge and pushed his way through dried crackelthorn to the facing edge of Kooluuwe Ravine. After one disgusted glance up the vertical face of the cliff, he commenced his climb.

Twelve Earth days, he thought; *only a mere twelve days. If I just can hold out . . . and not make any really deadly* faux pas *. . . I've got it made. It may not be comfortable, but the Shecklites seem to be as eager to make it work out as I am. I wonder,* he thought, not for the first time, *what in the world they see available from Earth that helps them to put up with me. They're not interested in gold or physics or Beethoven. It all seems to be centered around radishes and tiddlywinks and the works of Phillip James Bailey. That gets them all excited. Now who on Earth was Phillip James Bailey?*

By persistent climbing, and refusal to stop to discuss his problem with three other rogerians, Paul neared the top by midmorn. During the last ten meters, he heard voices from above him; they held a sneering quality not at all to his liking. He looked up. Outlined against the yellow sky stood several Shecklites looking down at him.

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He clambered up over the lip of the ravine and sat puffing. The Shecklites moved to encircle him. They were mid-adolescents, six of them, and he began to feel nervous. When he recognized one of them as Noowiioy, the mayor's offspring, he felt really depressed. There was a real bully for you.

Despite his exhaustion, he managed to regain his feet. "Got to get to the village," he said. "Eggs. Can't play now." He took a step towards the flametrees bordering the ravine.

Noowiioy took a sidewise step, blocking Paul's escape. "We saw you climbing," he said nastily, his face scrooching up in gray crinkles. "You want to know something? You're not a Shecklite after all." The other five laughed mockingly.

Paul froze in shock. No one was ever supposed to say that; it could be the sign of the end. The adolescents had been taunting from the beginning, even cruel, but none of them had stepped across that line before.

Noowiioy's face wrinkled again, with the humor of what he was about to say. "You're no Shecklite," he said again. "You're some kind of rockcrab."

Paul's heart picked up where it had left off. He had heard that phrase before among the youthful toughs. It was not a reference to his humanity, but a challenge to his Shecklite manhood . . . or perhaps (Paul had given up trying to differentiate in this area) his womanhood.

"I'm a better Shecklite than you, Noowiioy," he played out on his voder. "Now move aside and let me pass."

Noowiioy looked at his cronies. He raised his wings in a large shrug and let them drop again. "Hear that, guys?" he chewed. "Says he's better than we are! Shall we let him prove it?"

The others chortled unpleasantly and moved the ring in closer.

Oh, my God! Not another stupid challenge.

"Some other time," Paul played desperately, "I would be more than delighted to show up your snotty arrogance." He tried, while not cringing utterly, to choose his words carefully from the less provocative ones in use among the youthful gangs. "But as I am on an important mission to Youoory, I cannot pause to engage in your infantile . . ."

Noowiioy bent slowly forward from his upper waist until his beaknose brushed Paul's snub one. "Little rockcrab gotta do what his Mops says; little rockcrab run to store to get eggs; scared to show what a rockcrab he really is."

Paul sighed. He saw no way out. Noowiioy had chosen firm ground.

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The values were clearly marked; no real Shecklite youth would put parental instructions over a test of 'hoodness; the parents would be ashamed themselves in such a case.

"What did you have in mind, brain-molt?" he asked wearily.

"Rockcrab care to groundplunge?" the other asked bluntly.

Oh, Lord. Scratch one human being.

"Why not?" bluffed Paul. "If it's the only way to stop your asinine yappings."

"Okay. Here and now. I've been waiting months for this. Off the ravine right here, and the last one to lift wing wins."

Paul walked to the edge of Kooluuwe Ravine, the others following. He looked down the sheer drop. Not a chance. He looked at Noowiioy's five cohorts. They seemed nervous, uncertain. But not to the extent they were going to step in and stop this idiocy. His thoughts were running as fast as they ever had before.

"You *are* a cowardly mudworm, Noowiioy," he suggested mildly.

Noowiioy's face blued in rage. "You dare say that!"

Paul pointed down the cliff. "Why lift wing at all? We'll jump together from right here and go all the way to the bottom. If either of us lifts wing before striking bottom, that's being a rockcrab *and* a mudworm."

Noowiioy looked confused. "That's ridiculous. I'll go within ten lengths of the ground before I pull out. Bet you can't do that!"

Paul shook his head disgustedly. "Noowiioy, you're a bully and a boaster, but you just don't have it when it counts. I'm sick of all your ten lengths, five lengths, three, half a length. If you can't face going all the way, then stop bragging about your so-called guts. Put up or shut up."

"But you gotta pull out sometime," choked Noowiioy, not quite getting it even yet. "Or you'll be smeared all over the bottom!"

"Right. You can't face it, can you?" pressed Paul. "*I'm* willing. It might be fun." He looked at the others. "I'd like to show up this creep for the crabworm he is. If he won't jump with me, let's push him over, and watch him cop out."

"Hey, wait a minute!" Noowiioy was scrabbling rapidly back from the edge. He looked about at his compatriots, but the current of mockery had shifted. They were all in glee at seeing the tables so deftly turned. "Don't you see, he's bluffing—"

"Then call his bluff," said one of his friends mockingly.

"Yeah, Noowy, afraid to go all the way to the ground? Looks like *you're* the rockcrab."

They all chortled.

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Noowiioy stared wildly about. "But it's not fair," he said, his voice wobbling. "Don't you see? He's actually trying to *kill* me."

"He's willing to do it," said Geeyuuo. "And you're not."

"But *he's* not . . . I mean, he's not really a . . ." There was a sudden hush as all stared at him, wondering if he would actually break the unspoken taboo.

"Radishes," Paul played rapidly in minor key. "Tiddlywinks. Phillip James Bailey."

Noowiioy glared at him, and suddenly lifted wing. With a downrush of air on their upturned faces, he mounted to circle above them. "My father the mayor will hear about this," he flung down, and then was rising up towards the pole-mounted houses visible beyond the treetops.

The other youths crowded about Paul, clapping him on the thighs in friendly fashion. "That was beautiful," said Geeyuuo. "Noowy's been flapping for a fall a long time now. Say, would you really have gone through with it?"

Paul shrugged. "Why not?" he said indifferently. "What have I got to lose?"

He started walking towards Youoory village.

The village of Youoory tottered at the top of its tall poles in the wide clearing just west of the ravine. The poles were not intended for climbing, but they could serve the purpose. Paul crossed to the base of the one holding, among other establishments, the Aoweeyo Eggery.

Something massive, floppy, and quite unfamiliar lay sprawled at the base of the pole. As Paul approached, it raised an ursine head above flat flippers, and spoke to him.

" 'Oo 'r 'oo?" A gruff voice, squeezed out between rollers.

"I am Wayuueo of the Mestoiwe lineage," said Paul. "And you?"

" 'M 'oo'a'ee uv 'e 'ee'i'aa 'inea'," said the other.

"Oh," said Paul uncertainly. He had heard that there was another galactic exchange representative in the area, but this was their first encounter. He felt a surge of companionship for the alien. Perhaps here was someone who could feel for his own difficulties; he wondered if he dared venture on a little frank conversation.

A small voice piped from behind him. "Look, Mops; look at those two *funny* animals!"

"Hush, Uyee," answered a female-priority voice. "That is just two Shecklites talking together. They're just like anybody else. Remember that! Animals indeed!"

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Paul resignedly smiled at the other alien, and began to climb the post. He couldn't risk bringing trouble to three worlds. He wondered what the temporary 'oo'a'ee of the ee'i'aa would bring to the Shecklites in trade if he managed to fulfill his standard year.

The rough knotted wood, warm in the midday sun, offered good handholds for his climb. Weary as he was, Paul had soon attained the lowest level of Youoory, and paused to rest. The eggery was still five levels above him; this level was crammed with the apparatus servicing the eyrie—power, sewage, computer, and interplanetary teleport equipment. The Shecklites might be simple in their lives, and untechnological in their abilities, but they had very solid trade and diplomatic relations with the rest of the galaxy; they weren't primitives.

Paul crossed to the struts supporting the upper levels, took one glance up at the homes and shops dangling from the second level above him, and began to ascend. The Shecklites wouldn't have done so well in making and keeping Galactic contacts, he thought, if they hadn't been very tolerant of differences. Perhaps he was worrying too much; they wanted him to get through the next few days as badly as he did. Surely, even that idiot Noowiioy couldn't manage to mess up an important interracial relationship. He hoped.

Clutching his embryo sack of breeir eggs, Paul turned from the counter of the Aoweeyo Eggery, and stopped short. Above him towered the tall gray form of Mayor Bleewooe of Youoory.

Mayor Bleewooe looked down thoughtfully at Paul, who gulped helplessly. The mayor's puckered lips chewed slowly sideways in his leathery face—the smooth, lineless face of old age. The wide beak opened and words fell from the heights upon Paul's unwilling ears.

"If it is convenient for you, and no imposition, small one, perhaps you would honor me with a slight conversation. But if it is any trouble, then perhaps some other time."

As on Earth, the elected officials of Sheckley called themselves 'public servants.' Unlike Earth, they behaved as such.

Paul gulped again and managed to respond, in a combination of vocal and voder, "When I'm good and ready, you lump of obsequiousness." This also was standard format.

Formalities over, the mayor got to the point. "Young one, we have a problem, and I do hope you can spare the time to hear me out. When I speak of a problem, I do not mean only you and I, but the whole village of Youoory. More, this effects the entire province of

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Iewaooe. In fact, the continent of Eewayow is not exempt from interest in this affair. I dare say that the whole planet—"

"I'm listening," said Paul sullenly. "Spit it out."

Mayor Bleewooe nodded his head wisely for a moment, scratched his left shoulder blade with the tip of his right wing, and then enunciated solemnly:

"Small one, you must be aware of the method by which sentient races make, or fail to make, viable relationships with one another. I refer, of course, to the lottery system, by means of which one randomly chosen individual from a given species is selected to live a standard year as a citizen of another world. . . ."

Paul could say nothing. The mayor's roundabout words certainly sounded like the whiplash of descending doom.

Mayor Bleewooe was methodically continuing. ". . . so if the representative individual and the society he has joined can mutually tolerate each other for one standard year, then trade and diplomatic relationships can be entered into between the two species in question. But . . ." and the mayor drew himself up austerely, "if for any reason, *not,* then . . . not!"

Paul could not passively wait for the final blow without a last attempt to assert himself. "Sir," he frantically stumbled over his voder keys, "I mean, you bureaucratic underling, servant of the people, what has all this to do with me? No, rather, I do not care to know! I am . . ." He drew himself erect, and glared up at the mayor, "I am Wayuueo of the Mestoiwe lineage, son and daughter of Oyeuuwa and Jooweyu, of the Niiweyoi clan. Do you intend . . . can you possibly dare . . . to impugn my parentage? To cast doubt on my pedigree as a true Shecklite of the Shecklites, a child of my own peoples?"

Mayor Bleewooe gazed down at him for a long, heart-stopping moment, eye-hoods slowly descending over his white orbits, and then snapping up again like a released window shade.

"No," he said mildly at last. "I am sure you are a credit to your Mops and Poms, Wayuueo of the Mestoiwe. A good Shecklite," he muttered, turning away slowly, his aged face shaking as in disbelief. "A fine young Shecklite."

Paul exhaled, and gradually stilled the shaking of his whole body. Carefully planting each foot as he moved, he crossed to the eggery exit.

From behind him came the voice of the mayor. "Please be at home at sunset this evening, young one. You may expect a visit from the Council of Olders."

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Paul considered jumping and ending the whole mess at once. But even that would have taken too much effort. He began the long crawl home, his mouth filled with the bilious taste of futility.

"Care to tell me about your problem?" said the rogerian.

Paul slumped wearily on the ledge and carefully cached the embryo sack of breeir eggs in a safe niche. He looked down into Kooluuwe Ravine. The sun had long passed beyond the rim above him, and the bottom of the cleft was filling with late afternoon shadow. Another twenty minutes' climb should bring him back to the homestead.

"Not particularly," he told the lizard.

"You don't particularly want to tell me about your problem?" the lizard prompted.

Paul rested his chin in his cupped hands. "Don't ask questions," he said. "Give me an answer."

"You want me to give you an answer?"

"Yes," said Paul.

The rogerian was silent a moment. "Why do you want me to give you an answer?"

Paul was silent.

The lizard blinked its large azure eyes, and tried again. "What does your wanting me to give you an answer tell you about your problem?"

Paul was silent.

The lizard twitched nervously. "Why does your problem bother you so, *really?*" it said.

Paul collected his eggs and stood up, thinking. "I think what *really* bothers me most," he said at last, "is that Poms and Mops will be so disappointed in me."

He resumed his climb.

Shortly afterwards he heard the slow beat of wings above him, and saw the full Council of Olders flapping their way across the ravine from the direction of Youoory Village. They circled once above him and passed out of sight in the direction of the Mestoiwe cave. By the time Paul had crawled over the rim to the ledge fronting his home, the whole delegation was squatting in a wide semi-circle, delicately nibbling the Kabisco bars Mops saved for special occasions.

None of them looked in his direction until he crawled drearily up to them and handed the embryo sack to Moppom.

"They have come to talk to you, Wayuueo," Mops told him nerv-

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ously. "It sounds like it's very important. I'm afraid that . . ." She couldn't finish.

Paul turned to the silent crescent of Olders. He could feel the nails of his hands biting into his palms. This wasn't going to be easy. He took three steps forward and halted, his eyes downcast.

Mayor Bleewooe slowly rose to his feet and stared at Paul a long moment. He scuffed his feet on the ground, kicked at an embedded rock, frowned ponderously.

"I have an official announcement to make," he said. "It is not an easy thing to tell, it is a difficult matter to broach. But it must be said, it cannot be otherwise."

Paul felt a sudden urge to push the garrulous mayor off the cliff, but that would solve nothing. He waited.

Eventually the mayor continued. "It is a very important matter, the lottery system," he said bluntly. "It is at the base of the life of all of us here on Sheckley. Without the economies and arts and sciences we have gained from Galactic contacts, our lives would still be short and narrow and miserable as they were before we reached the stars and joined the lottery exchange system." He looked steadily at Paul. "If it is at all possible, if there is any hope at all, we shall do all in our power to make and keep relationships with the other creatures in the Galaxy. Every Shecklite knows the importance of this." He cleared his throat, looking deeply embarrassed.

Paul considered saving everybody further embarrassment by two steps and a jump into the ravine. But the Shecklites would just catch him on the way down. It was useless.

Slowly the Mayor stretched out his leathery wings. "I know you will do well for us, Wayuueo of the Mestoiwe," he was saying huskily. "Tomorrow you will be taken by webship to the world of the Dreffitti. You have been chosen by lottery as Sheckley's representative to those beings."

As the whole delegation and then his family stroked and hugged and ogled him, Paul could hear the mayor's voice ricocheting on: ". . . live in chlorine bubbles under the waters of the muddy estuaries . . . gourmet delicacies and temperature control techniques of huge value to our world . . . far the greatest honor that can befall a Shecklite."

And, oh, were his Poms and Mops proud of him!

A little later, during the formal speeches, Paul *did* step off into the ravine, but they caught him before he fell fifteen feet. Nobody remarked on his awkwardness at such a moment.

After all, such an honor would fluster anybody.

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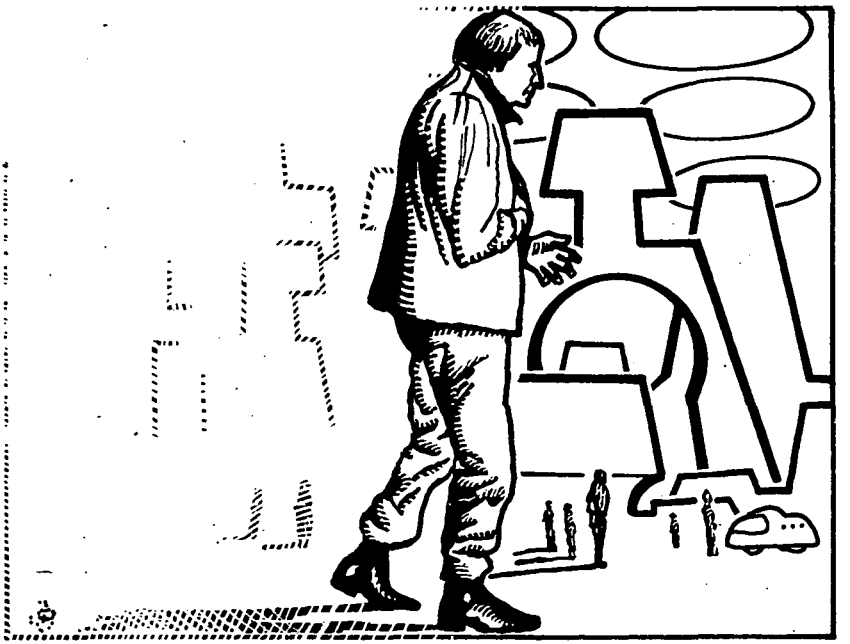
WHEN THE OLD MAN WAVES THE BANNER

by Sharon N. Farber

art: Jack Gaughan



The author wishes she could report something exciting (e.g., her racing armadillos winning the Preakness), but life at medical school is intense yet dull—a wonderful source of ideas which provides no time in which to write them.

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Nothing is more useless than a living martyr.
—Montes

Yonn was trapped; the room had no escape. Outside the unbreakable window, the city sparkled in the sun. *How beautiful it will be,* he thought, *when the tyrant's shadow is gone.*

He sat back in the overstuffed chair and watched the holo. Little figures spoke recognizable words, even coherent sentences; but each moment of the drama seemed alone and divorced from reality. He didn't have the foggiest notion what the play was about. *Why haven't they killed me? I'm too dangerous to be kept prisoner.*

There was a soft noise and the door opened. Yonn sprang to his feet, ready to fight. He felt slow, weak. . . . *Drugged? Maybe I haven't fully recovered from the operation.*

"Yonn?" A stranger stood in the doorway, a chunky, middle-aged man with graying temples and a gray suit. "Don't speak loudly—I've come to help."

"It's a trick. You want me to betray the cause." He grinned. The rebels had planned to move to a new headquarters right after the operation. It amused Yonn to think of the enemy wasting time trying to get the new location from him.

"You fool, Yonn. I'm here to set you free. Long live Montes. Death to Zorno." He came forward, clapped a stunner into Yonn's hand, then began to leave. He smelled faintly of cinnamon.

Yonn stared at the gun. "Wait—I won't remember long, friend; but tell me your name."

The stranger stifled a laugh. "My name? Certainly: Roye." He disappeared out the still open door.

Yonn tucked the gun inside his tunic and followed Roye out. "Roye," he whispered. "I was freed by a man named Roye. I wish all could know he's helped. Death to the tyrant Zorno." He walked quickly down the corridor (clean, painted in warm colors—not what Yonn expected from his prison) until he found the stairs. "Roye," he mumbled. The stairs seemed to go on forever. At last he reached ground level and strolled casually through the crowd in the lobby. *Roye was his name, Roye . . . I must go to the palace. Once there, the old man will wave a banner and start a diversion. I'll have, at most, fifteen minutes to reach Zorno.* He stepped into the exit bay. A word seemed on the tip of his tongue—*Gone.*

Yonn realized that the building he was leaving was the state hospital. *Why was I there? I must be fully recovered from the operation. Now for my job.*

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It was warm in the city's controlled environment. Yonn passed two children playing, then some women, then a gray man smelling of cinnamon. *I was trying to remember something—no matter. I must hurry and kill Zorno so these children will have lives free from the psychic monster. My daughter too . . .*

He felt disoriented, as if each moment were a pearl, separate from all others on the string. The streets were as they should be, broad, glittering, full of people. But the people—their hair and clothing were subtly wrong. Not a single one had the glassy look of Zorno's thought slaves. Some buildings Yonn knew well, others were different. The discrepancies worried him until he remembered the power of Zorno, sitting in his sentient palace sending warping thoughts into the minds of all. Perhaps Zorno knew of the assassination plan and was broadcasting confusing messages—Yonn decided to ignore the strangeness about him.

He stopped at a drinking fountain. *Where? I'm in Good Hue Park, near the palace. I must be on my mission.* The water was cool in his throat. A girl who looked a bit like his Gina was building a wall of small stones. He wanted to shout, "I am going to die so you can grow up free." His mouth was wet—*How long have I been here? I mustn't delay. I have a task. . . .*

The water ran down into a silvered pond. He saw what should have been his reflection. *But it's not me!* The man's face was lined, the hair white, the eyes circled with black. *No!* He summoned the image of himself in the mirror each morning, firm jaw, thick brown hair—"the face of a hero," Montes used to say, psyching him up for the suicide mission. "A face our children will revere as long as civilization lasts. The man who killed Zorno." *It's not past tense yet,* Yonn chided himself. *Let's get it over with.* He left the park. Passing the pond, he saw the reflection of a white-haired man with tortured eyes.

He was walking down Grand Avenue. *I am walking down Grand Avenue.* A sign read **Martyred Yonn Street.** He muttered, "It won't work, Zorno. I alone of all living beings am immune to your mental tricks."

"Yonn! You shouldn't be here."

What a time to meet someone I know—act casual. He said, "Hello. Lovely day. . . ." The young woman's face was unfamiliar. She was dressed prosperously, and wore the badge of a minor bureaucrat.

"You should be in the hospital."

"Oh, no, I've recovered," he whispered. She must be from the team that cared for him after the surgery; he knew he couldn't recognize

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her or anyone else he'd met since then.

She said, "I know you can't remember me, though I've been visiting you for ten years. I'm Gina."

"That's my daughter's name too," he said pleasantly, beginning to pull away. He had to get to the palace.

"I am your daughter!"

He yanked his arm away, headed angrily down the bright street. She ran forward and stood in his path. "Look at the street sign."

He read it. " 'Martyred Yonn Street.' No. It's one of Zorno's tricks."

"Zorno's been dead ten years! Listen: no one could reach Zorno to kill him."

"Speak lower, you fool." *She knows so much . . .*

"It's no secret—they teach it in the schools now. Once assassins entered the palace, he distorted their thinking, changed their attitudes. They were unable to harm him. So you volunteered for the mission. You knew it was sure death."

I can't believe this. She knows it all.

"They cut into your brain—bilaterally ablated parts of the hippocampal formations. You have all your memories up to that point but can't gain any new ones. Zorno couldn't stop you, couldn't change your ideas."

He nodded reluctantly. "No processing of short-term memory into long-term. I don't really feel different, but I don't know how I got here. I'm just standing on Grand. Therefore I realize the operation must have been successful. But since you know all this, you know why I have to hurry."

"No," she screamed. "Listen to me! You've already done it, you killed Zorno ten years ago. They thought the guards would get you, but with Zorno gone . . . But you can't learn anything new, so you don't remember—you've spent a decade without knowing what or where you are. You must believe me. Admit it, it could be true. With your brain the way it is, you have no way of knowing it isn't true."

"True . . ." His eyes widened as he stared at the woman's strangely cut hair. "Who are you?"

"I'm your daughter Gina! Let me take you back to the hospital—it's not a trick. Zorno's been dead ten years. See the street sign? 'Martyred Yonn' . . ."

He looked at his hands, at the veins gnarling the skin. "Ten years? Zorno dead?" He allowed himself to be led back into the park, toward the looming hospital. They passed a water fountain, then a grove of trees and a child playing with stones. Yonn said suddenly, "Where—? This isn't the right direction." He pulled his hand from

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hers and ran back, towards the palace.

"No," she yelled. "Daddy, no!" Her screams changed to "Guards! Help!" *Who is she? I've been found out. Maybe if I hurry . . .*

He was at the palace. For some reason he was running. *Should I stop and act casual? Or was I hurrying for a reason? Damn. Without memory I'm a ship adrift.*

He saw the palace in its courtyard crowded with supplicants, merchants, tourists, all as unconcerned as in his pre-tyrant childhood. *The palace must be broadcasting images of contentment.* Zorno's statues were gone and their replacements were unfamiliar. One was Montes; another, a soldier of the rebellion, with strong jaw and visionary gaze. "You'll make an inspiring sculpture," Montes always said with a laugh. The strangeness of the delusions startled Yonn. *Wish fulfillment?* He gazed about wildly until he recognized the palace and knew where he was. His life was almost at its end. . . .

He pushed through the crowd, looking for the old man. *The old man will be on the steps. When he waves the banner, people will start the diversion. Many will die. I'll have at the most fifteen minutes.*

The old man wasn't there. But there was a diversion. Yonn heard a woman screaming his name. "Yonn! Yonn! Don't! You don't understand!"

"Oh damn," he said, and began running. He ran past a guard who only stared after him. He ran down the wide living-crystal halls, exactly as in the plans he'd memorized. He waited for the psychic onslaught to begin. How would it start? New thoughts would suddenly be in his mind: *you love Zorno, you can't hurt him, you've always worshipped him.* Yonn laughed as he ran—and wondered why he was running. But that was clear. If he was running, then outside his fellow revolutionaries were rioting and dying, giving him those precious fifteen minutes.

He was outside the Room of State. He pushed open the doors and paused. The chamber was a huge, over-decorated testament to the oppressor's power and wealth. The throne was small amidst the splendor. Heads turned, mouths gaped.

I'm here! He ran again, unafraid to kill and die, hand reaching for the stunner, flicking the control to full. Shocked people flowed from his path.

He raised his arm, aiming at the throne. Someone in a gray suit cried "Sir! Look out!" The man on the throne had his mouth wide open, his head tilted unbelievingly. His face was not Zorno's. It was older; but it was definitely Montes, Yonn's leader, Yonn's friend.

"You can't fool me. Montes's face won't save you," Yonn cried.

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"Die, tyrant!" He fired and the man fell in a pulse of amber light.

"Montes," the audience screamed. The gray-suited man clutched the corpse. Yonn fired at him but the gun was empty. *Only one charge? Why did I . . .* His thoughts became more frantic as he pummelled at the angry crowd engulfing him, weighing him down. "Kill me. I've done my duty. Zorno is dead! Long live Montes!"

I hope I killed Zorno. Did I fire the shot?

He was twisting in the hold of two guards, who moved him forward toward a corpse lying face down before the throne. It had to be Zorno—*I did it!* The guards held him before a middle-aged, thickly built man with silver hair at his temples. Yonn was close enough to smell cinnamon. A well-dressed woman clutched at the gray suit.

"He's not to blame. He was programmed."

"Calm down, Gina," the man answered. "When tempers cool, the others will understand that it is not your father's fault. He's like a loaded gun. I shall personally investigate his escape and punish those responsible. Their negligence, not your father, has killed President Montes."

She said weakly, "Thank you—*President* Roye."

In a louder voice he said, "return Yonn to the hospital. His deed does not change the fact that he is the hero who slew Zorno." People muttered angrily.

I've done it. I've killed Zorno.

Rough hands bound him to a stretcher.

Now they'll kill me.

The transport vehicle was quiet and dim. A guard leaned over the stretcher. "You shot the president, you bastard. I hope it makes you squirm."

An attendant said, "Don't bother telling him. His brain's egg salad. Fifteen minutes from now he won't remember a thing you've said."

Fifteen minutes. When the old man waves the banner I'll have fifteen minutes.

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Son of ETAOIN SHRDLU: More Adventures in Type and Space

by Sharon Farber, Susanna Jacobson, and James Killus

Escaping from medical school for a few days, Ms. Farber visited her old haunts in the San Francisco Bay Area, where she found some co-conspirators for sharing the blame for this . . . Thing.

"It's here, Fido! My word processor!" Fido flopped his tail as Arnold tore open the packing crate and assembled the device.

"It'll be a lot quieter than my old typewriter," Arnold promised. He sat down and typed **The quick brown fox jumps over the lazy dog.** Then he hit the **Print** key. *Click, whirr, tapocketa,* went the printer in a muted voice.

Out of the corner of his eye, Arnold saw a brown blur speed out of the kitchen, leap over Fido, and disappear out the window. "What the . . . ?"

Arnold went to the garbage can and fished out the packing crate. It said **Acme World Processor**. "But I ordered a . . ." He hunted up the carbon of his order form, and sure enough, he'd typed **world** instead of **word**.

"This might be the luckiest typographical error of my life, Fido," Arnold said. He sat down at the processor and typed again. **The quick brown fox jumps over the lazy fog.** *Click, whirr, tapocketa.* He swivelled just in time to see the fox tear out of the kitchen and hop over a hovering mist. Arnold was too euphoric to notice the watery fate of his faithful pet, not even when the fog meandered out the door on lazy dog feet.

"It *is* a world processor. I can make a fortune!" he exulted, and he typed in **I have a million collars**. His finger was on the **Print** key when he pulled up short. Collars? Whoa! He backed up the device. Erase **c**, and insert **d**. "Lucky I noticed. Imagine the entire house filled with plastic or leather dog collars, piled floor to ceiling, blocking the windows, threatening to cave in and bury us. Whew! Quite a scary picture, even to a dog, eh Fido? Fido? Where's that dog gone

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to?"

Dollar bills were raining from the ceiling; and he suppressed an urge to gather up a handful, throw them into the air and let them hit him on the head. With wealth came responsibility.

"Enough selfishness. This is a great blessing that I should share with all of mankind."

Let there be pease on earth. He hit the **Print** key an instant before he noticed.

The *click, whirr, tapocketa,* was drowned out by the crack of thunder. The lightning flashed green. Outside, the porridge rains had begun.

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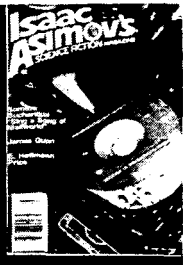

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THE SF CONVENTIONAL CALENDAR
by Erwin S. Strauss

For those who've wanted to meet the Good Doctor, this month is your chance. Get out for a social weekend with your favorite SF authors, artists, editors and fellow fans soon. For a longer, later list, an explanation of cons, and a sample of SF folksongs, send me an addressed, envelope (SASE) at 9850 Fairfax Sq. #232, Fairfax VA 22301. The hotline is (703) 273-6111. If a machine answers, leave your area code and number and I'll call back at my expense. When writing cons, enclose an SASE. Tell me about cons 5 months ahead (address/phone above) for free listings.

DisClave. For info, write: **4020 8th St. S., Arlington VA 22204.** Or phone: **(703) 920-6087** (10 AM to 10 PM only, not collect). Con will be held in: Arlington VA (if location omitted, same as in address) on: 22-24 May, 1981. Guests include: I*S*A*A*C A*S*I*M*O*V.

ConQuest, (816) 753-2450. Kansas City MO, 22-24 May. Poul Anderson, Don Thompson, Lee Killough, W. A. Tucker, James Gunn, C. J. Cherryh, John Kessel, Ardath Mayer, G. Cook.

AmberCon, (316) 262-6298. Wichita KS, 29-31 May. G. R. R. Martin, Ken Keller, Ed Bryant, Rick Sternbach, Walt Liebscher. 3rd annual con inspired by Roger Zelazny's Amber stories.

NorCon, c/o Lonergan, Box 148, Earlswood 2006 NSW, Australia. 29-31 May. At Auckland Univ.

X-Con, 1743 N. Cambridge, Milwaukee WI 53202. 12-14 June. The de Camps, Bev & Gene DeWeese.

CosmoCon, c/o McCue, 34 Halsey, Hutchison KS 67501. (316) 683-3799. 13-14 Jun. James Gunn.

Advention, Box 130, Marden 5070, South Australia. Adelaide, Australia. 13-15 Jun. Frank ("Dune") Herbert, John Foyster, John Ossian, K. U. H. Widdershins. Australian nat'l con.

MidWestCon, 3953 St. Johns Terr., Cincinatti OH 45236. 26-28 Jun. Where old-timers unwind.

WesterCon 34, Box 161719, Sacramento CA 95816. 2-5 Jul. C. J. Cherryh, Grant Canfield.

InConJunction, 1415 N. Somerset Ave., Indianapolis IN 46222. 3-5 Jul. Philip Jose ("Riverworld") Farmer, Wilson Arthur ("Ice and Iron") Tucker, old-time fan Ray Beam. 24-hour video.

EmpiriCon, c/o TESSFA, Box 682 Church St. Sta., New York NY 10008. 3-5 Jul. NYC's big con.

FantasyCon, c/o Mike Chinn, 1 Buttery Rd., Smethwick, Warley, West Midlands B67 7NS, UK. Birmingham, England, 10-12 Jul. 7th annual British Fantasy Convention. At the Grand Hotel.

Archon, Box 15852, Overland MO 63114. St. Louis MO, 10-12 Jul. Fifth annual St. Louis con.

FairCon, 200 Woodlands Rd., Glasgow G3 6LN, UK. 24-26 Jul. John Brunner, fan Ken Slater.

NECon, c/o Booth, 67 Birchland Ave., Pawtucket RI 02860. Bristol RI, 24-26 Jul. Peter Straub. Les Daniels, Pete Pautz. $50 for single room, board & registration at Williams College.

ParaCon, c/o Casto, 425 Waupelani Dr. #24, State College PA 16801. 24-26 Jul. Wm. Tenn.

RiverCon, Box 8251, Louisville KY 40208. 31 Jul.-2 Aug. Sunday afternoon riverboat cruise.

B'hamaCon, Box 57031, Birmingham AL 35259. 28-30 Aug. DeepSouthCon. En route to Denver.

Denvention II, Box 11545, Denver CO 80211. (303) 433-9774. 3-7 Sep., 1981. C. L. Moore, C. Simak, R. Hevelin, Ed Bryant. WorldCon. $45 till 15 Jul. East Coast train group planned.

WesterCon 35, Box 11644, Phoenix AZ 85064. (602) 249-2616. 2-5 Jul., 1982. Gordon Dickson.

ChiCon IV, Box A3120, Chicago IL 60690. 2-6 Sep., 1982. A. Bertram (Rim Worlds) Chandler, Kelly Freas, Lee Hoffman. The 1982 WorldCon. Go to other cons to prepare for WorldCons.

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WIND INSTRUMENT

by Steven Gould
art: Evan TenBroeck Steadman

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Mr. Gould is another writer who is owned by 'his' word-processor (loosely, a home computer). He (Mr. Gould, not the word processor) was born at the U.S. Army installation at Ft. Huachuca, Arizona, and grew up in places like Taiwan, Germany, Thailand, and Hawaii. He presently lives in Houston, Texas. He is 25 and single; this is his second sale.

In the desert, the wind plays tunes on the telephone lines and barbed wire fences. It whistles through nooks and crannies and carries sand to make castanets of worn bleached wood. It sings songs to make Caruso cry.

In the desert, I lift my cup to each of the wind's four quarters before a single drop of water touches my lips. Ekmann didn't, but he does now.

Juilliard's treasure, Ekmann was called a young Toscanini by those keepers of the "Truth," the New York music critics. No conductor had ever been hailed so strongly at such a young age. He performed miracles with the most mediocre of orchestras. Ekmann conducts Mozart—Ekmann does Saint Saens. Ekmann conducts Dvŏrák in Budapest and Borodin in Leningrad. Ekmann does Gershwin in Brooklyn.

One day in October, Ekmann came to me.

In my garden water runs from pool to pool, diverted here and there into ceramic containers. These colorful jars are mounted on pivots and, when they fill, they tilt and dump their contents. Wooden strikers, struck by the streams of water pouring into the jars, strike in turn the sides of the jars. *Voilà,* a bell-like note, peals of muted laughter.

In one jar, this results in a series of notes that drop in pitch as the jar fills, then stop as the jar tilts and dumps its water, then begin anew. The overall effect is fugue-like, many series of falling scales, all different as the jars have different heights, diameters, and thicknesses.

I made these noise makers, and it seems I'm always fixing them.

"Incredible. Absolutely incredible."

I straightened from the soggy striker I was adjusting and turned, knee deep in water. Karl Ekmann had walked down from the house.

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He looked different, much more at home, now that he'd removed the suit and tie he'd arrived in. His eyes, though, remained unchanged. They still broadcast the man's drive and hunger for life in the way they devoured everything in sight.

"Are these shoes suitable, Allan?"

I walked across the pond, shuffling my feet over the bottom. We keep catfish, and to step on one means days of not walking.

"They'll do quite well."

"I am afraid Handel would be jealous of your *wasser musik,*" he said, pointing at my jars. "I've been listening over ten minutes while you piddled. How do you get the scales to rise so cleanly?"

"Logarithmic sides. The diameter decreases as the height increases. Since the relationship between column height and pitch isn't at all linear, I made sure the water would climb faster as it neared the top. I'm sure you noticed we make no attempt to keep them in any one key."

"Oh, yes. It reminds me of some Chinese music. I'm impressed. It's no wonder your creations command the attention they do."

"Thank you. Coming from you, that's high praise."

"Well, are we ready to see the harps?"

"Let me put on *my* shoes. The path is very rough."

Our home is in a box canyon sliced into two square kilometers of rock known as Sprague's Hill. It's an up-jutting formation left over from the Permian Period that nature's more persistent tools, wind and water, exposed from the surrounding strata. Karl and I climbed the steep canyon side to the top.

"Shh. We're almost there. Listen."

Karl stopped and cocked his head.

Above the sigh of the wind came a sound not unlike a viola playing a single note. Then, quieter than the first note, came another, a minor third higher in pitch. A third note sounded, five whole steps above the first, creating a minor chord.

I plucked at Karl's elbow and motioned him on up the path.

I had mounted the harps on a small mound of rock overlooking a large shallow bowl known as Sprague's Hollow. The base bolts were set ten centimeters into stone. They came into view, colorful pillars stabbing the darkening sky.

Imagine, if you will, a triangular prism with concave sides standing upright. Down each of these sides, five centimeters away from the prism, runs a string. At the bottom of each string is a turnbuckle used to tune it.

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"See how the shape of the column keeps the wind from striking any more than two strings at once? As the wind shifts, different strings are played. By controlling the pitch of each string, I can control the key, but never the tune."

"You talk too much. Let me listen."

The wind swung more northerly, changing the harmony. Changes in air velocity brought crescendos and diminuendos. Turbulence from updrafts at the mesa's edge and from the weird currents over Sprague's Hollow caused the wind to change direction more often, moving the piece to *andante* and, as the changes came more smoothly, *adagio*.

The harps sang of soaring vultures and stooping hawks, of storms tempestuous and sunsets colored by boiling walls of sand.

And, always, they sang of the wind. The mighty North wind that puts frost on the sotol leaves and sends rabbits into the ground. The Southwest wind that brings dryness from Mexico, parching an already parched land. The West wind that brings hail from New Mexico and bends even the Spanish dagger. And the East wind that drags moisture from the Gulf for infrequent showers and sudden flash floods.

They sang of the seasons and the passing of years—eons. They hinted at a time when nothing would cross this land *but* the wind. For as long as one gaseous molecule of matter floats above this planet, there will be wind.

Karl turned to me with tears in his eyes. His jaws worked to say something but nothing came out. He groped for a handkerchief and blew his nose. Then we walked around the Hollow and down the path to the light and warmth and humanity my house suddenly represented. We did not talk on the way.

Supper brought animation back to us both. Chris, my wife, didn't need to ask what had come over us—she'd been to the harps. She fed and dined us well, and gently drew amusing stories out of Karl that brought tears of mirth to all our eyes. After supper, with great effort on both our parts, Karl and I coaxed a Bach flute piece out of Chris.

"Bravo!" Karl said at the music's conclusion, and not just to be polite. "That's the first time I've heard that the way it should be done. Who did you play with?"

I answered for her. "Christy played with the San Antonio Symphony before we were married. I've earned the undying hatred of every music and beauty lover in San Antonio by dragging her to

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this place."

Chris blushed and set about clearing the table, a job I usually take care of since she does most of the cooking. I pulled her back to the couch and said, "We'll get the dishes later."

Talk of music brought us back to harps.

"How did you decide on your string material? Trial and error?"

"Not at all. There is a precise relationship between pitch of a string and its length, tension, and mass. The trick is finding a string with a large-enough cross-section to be stirred by the wind and yet have a low enough mass to keep the tension reasonable." I squeezed Chris's hand. "If I'd used four millimeter dacron rope as I'd first intended, the tension required to bring the pitch up to middle C exceeded the breaking strength of the rope ten times over. We're talking tensions equivalent to suspending 5,500 kilograms by that tiny rope."

"And that's why you're using monofilament?"

"Right. Tensions in the tens of newtons, instead of thousands."

"Is there any way to increase the frequency of pitch change?"

"What do you mean?" I asked.

"Well, you have fifteen strings atop the mesa, no more than ten of which can play simultaneously. However, because the winds are generally prevailing, the notes played over a period of fifteen minutes are pretty much the same. Though the results are magical, they are rather chordal, lacking in melody. Of course the changes in tempo and intensity are superb, but how many times can you listen to *Bolero* before going crazy? The piece is the same melody over and over again with changes only in intensity and tempo."

I saw his point. "Offhand, I can think of several ways to induce rapid note change. I could mount the strings on a large wind-powered merry-go-round that would expose the strings to the wind sequentially. This would give you melody, but it would also dictate it. Another way would be to put walls around the harps at intervals. As the wind goes across the left-hand edge of any wall, vortices will be produced that travel across the harps. This would simulate very quick changes in wind direction. As the vortex passes across a harp, it will get wind from, say, the left followed by a lull as the eye passes, and then the wind shifts to the right."

Karl sat back with his wineglass and mused.

"I see it now: *Concerto for Flute and Dustdevil.* I like that very much."

"That's not bad, but I have a better solution."

"Oh?"

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"We're going to let ghosts play the harps."

Karl smiled. "You haven't had that much *Kabinett*."

"Ah, but it goes straight to my head."

"Well, go on. Where will you find your spirit musicians?"

I pointed back toward the mesa. "One kilometer—that way."

Part of any art form is its presentation. A three-D sculpture should not be displayed in a nook that defeats viewing from all sides. A ballet should not be shown immediately after a rock concert.

I paused to build some tension.

"In 1883, this ranch was owned by a man named W. T. Sprague, who lived here with his wife and two children. One day while he was close to the house, they were attacked by a band of seven convicts who had escaped from New Mexico Territorial Prison. The convicts marched W.T., his wife, and two kids up on the mesa to a bowl shaped depression called 'Sprague's Hollow.' That was that hollow below the harps, remember?"

Karl nodded.

"At the Hollow, they took turns raping W.T.'s wife in front of him. Finally, the convicts tired of this and shot all four of their captives. Then they died, themselves, very quickly in the same hollow.

"A troop of U.S. Cavalry, dispatched to capture the convicts, arrived *not* in the nick of time. They were within two hundred meters of the Hollow, following the trail, when they heard the murder of the Spragues. The caught the convicts completely by surprise and killed them all.

"All told, eleven people died in the Hollow in the space of ten minutes."

I paused to sip my wine. Karl was staring at me with morbid fascination. Chris was smiling indulgently . . . she'd heard this before.

"Just walk up there. You can still hear the screams."

"You're joking." Karl sounded horrified.

"Yes and no. As recently as 1934 people have reported hearing screams and harsh laughter in that Hollow. There was a group of drunk cowhands who went up there one night on a dare. Each of them swore they could hear the screams. One of them went back and tossed a stick of dynamite into the Hollow. He said he wanted to give those tortured souls release.

"Well, either the dynamite released their souls or it affected the acoustical properties of the Hollow. In either case, the screams of Mrs. Sprague aren't heard very often anymore."

"Does that mean they're heard at all?"

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"I've heard them, and so has Christy. Conditions have to be just right, though."

Karl shuddered. "What has that to do with the harps?"

"The mesa, at that end, is honeycombed with holes. When the wind blows against any side of the escarpment, low- and high-pressure areas are formed causing high-velocity drafts of air through the honeycombing. Because of the complexity of all these pathways, you get gusts of air blasted into the Hollow through any of twenty-seven holes at seemingly random choice. And it doesn't matter what the direction of the wind. It's almost as if the escarpment is a giant fluidics device."

"Fluidics? *Was ist* 'fluidics'?"

"Well . . . a fluidic amplifier is an example. It depends upon the different pressures and flows of a fluid through precisely shaped grooves and channels to operate. An example of a fluidic amplifier is a carburetor. It moves more fuel into the manifold in response to a drop in air pressure. That the low pressure is produced mechanically is immaterial. Any drop in air pressure would cause fuel to flow."

"I see, but there is no water in the wind, at least not enough to count."

"Air *is* a fluid. A fluid is not just a liquid. If you've ever felt cold air flow down a hill or seen clouds pour over a mountain ridge then you've known fluid behavior of air."

"Then by chance, the network of tunnels under Sprague's Hollow acts like, uhmm, a switching network? Sounds like a telephone switchboard."

"Good analogy! There are fluidics devices that rival telephone relay boards in complexity. The advantage of fluidics is no moving mechanical parts."

Karl shook his head. "How does this relate to your ghost story?" His stare was intense, unblinking.

"First tell me, Karl, what is a pipe organ?"

"God's first choice in keyboard instruments."

"No, no. What makes up a pipe organ?"

"Well, it's a set of pipes with reeds in them that sound when air is blown through them."

"Would you feel safe in saying that a pipe organ is a collection of open-ended cylinders of different sizes that create specific pitches when vibration is induced into the enclosed column of air?"

Karl sniffed for a trap. "Not exactly. The pipes of an organ are closed on one end. Other than that, certainly."

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"Well, different formulae apply for columns closed on both ends, but it's still the same idea." I started gesturing with my arms. "Within the escarpment are undoubtedly sharp turns and twists in the ducts, turns which produce turbulence as the air rushes around them. Turbulence in turn fathers vibration. Vibration produces sound."

Karl nodded. "Like wind whistling through a knothole in a wall."

"Exactly. Due to column lengths and factors we can't imagine without a detailed blueprint of this natural duct system, you get different pitches. Everything from low moans of terror to high shrieks of pain. And, to make things spookier, a sustained tone generated in the depths may change its apparent direction several times as the switching effect carries the sound from first one hole and then another."

Karl's hands waved expressively. "Yes! Imagine standing in the hollow and hearing something behind you, so you turn. The sound switches to your back again. You spin again and it switches to your right, or both your right and left, or all around. Unnerving at the least."

"So right." I stood and put a piece of wood in our Franklin stove. As the iron door opened firelight danced and sent flickering shadows across the wall. "Imagine doing *Night On Bald Mountain* there."

"Or *Danse Macabre,*" suggested Chris.

"*Hall of the Mountain King,*" said Karl. "How will you place the harps?"

"One string before each of the openings. I won't use the pillars—the hollow will select which string to play. As to how we tune the strings, that depends on what sort of musical format you select."

Karl was quiet for several moments.

"I see several possibilities. One is to choose our music ahead of time and to tune accordingly. I.e., major or minor chords picked for the music to avoid dissonance. First, though, I want to take two and a half octaves, say from C2 to F4, and tune it every half step. Then I'll take eight or so innovative soloists and let them carry an interweaving melody against the harps. The score will look odd because I'll have to arrange for some signals for key shifts to compensate for variation in the harps. I expect strange and not necessarily pleasant disharmony.

"Finally, I'd like to take single gifted soloists and let them do their best at improvising against the harps' background. Christy, would you pipe for me?"

Chris stirred. "I'm not in practice."

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"Nonsense! You have an obvious talent. I won't let you say no."

"I bow to the inevitable." She was obviously pleased.

"Good. What would be more appropriate than a wind instrument playing with the wind?"

Karl arrived two days before the rest of them, with a four-wheel-drive pickup truck full of equipment and two sound technicians. After lunch I directed them to the one side of the mesa that the truck could negotiate. A garden of car-sized boulders would not let us drive the last three hundred meters, so I led them up the path to the lip of Sprague's Hollow.

Karl and the two technicians caught up with me and looked down into the Hollow.

Imagine a shallow bowl fifty meters across and ten meters deep sloping gently to its center. Boulders and old tumbleweeds were littered randomly across it; and off center but near the bottom was a pocket of rubble, the product of an old explosion. By the rubble stood a large canvas shelter I'd put up for my tools and, later, the sound equipment. From where I stood with Karl, I could see irregularly shaped holes spaced almost evenly halfway down the far side of the bowl. The symmetry was spoiled in two places I could see from that vantage. From experience, I knew there were twenty-seven holes in all, all about halfway down the bowl.

My latest version of aeolian harp stretched across each of the holes; two iron stakes set deep in the stone on each side of the hole with a turnbuckle on one stake and a sound box on the other. A string hung slackly from turnbuckle to box, untuned, awaiting Karl's direction.

Karl walked down into the Hollow, followed by the rest of us. He stopped in front of the nearest harp and peered into the hole. A sudden blast of air coming out of the hole startled him and he scrambled back.

"Mother of God, that's strong. Are they all that strong?"

"Stronger. The wind isn't that fast right now. The exit speed is always at least twice the current wind velocity. Usually stronger." I pointed to the bottom of the bowl. "We'll put the recorders under that tarp."

Karl nodded. "All right. I have the tuning forks and my list of scales in the truck. While Johnny and William set up the recorders and mixers, we can get started tuning the harps."

First, the four of us spent the next half hour unloading the truck. There were only two actual tape recorders; but there were boxes

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and boxes of microphones, cables, recording tape, and batteries. Then there was the mixer—the device responsible for taking over thirty different mike inputs and feeding them to the recorders as just two or four signals.

Finally, this task completed, we set about our individual chores. Karl and I went from harp to harp, he striking his tuning forks and plucking the string, while I twisted away on the turnbuckle with wrench and pliers. As we worked our way from harp to harp, it was almost as if the Hollow was finding its voice. The strings already tuned would suddenly come to life with a burst of notes, singly or in combinations of chords. The more harps we tuned, the less tentative the Hollow became. Stretches of sustained melody would suddenly burst forth and, as suddenly, stop.

I had already done this before, so I wasn't as distracted as Karl or the technicians. They were constantly looking up from the task on hand and listening as the melody took some surprising new turn or bordered on the familiar. Since Karl wanted to start by having his people do existing music, the harps were tuned in F Major. This avoided jarring disharmony and produced pleasing chords the majority of the time.

Finished, we fetched beer from the truck and listened as the sun went down. The desert sunset and the aeolian harps made for an ethereal beauty. We sat, hardly talking, for twenty minutes.

"Come. If we don't get down the mesa while there's still light, we'll have to walk."

The next day was Tuesday, the thirtieth of October and Halloween Eve. We started early in the afternoon to bring in the rest of our equipment. Things like chairs and music stands, a screen and portable toilet, and water for washing. Food we would bring tomorrow as well as ice chests of drinks.

Since the weather was clear, Johnny and William started running the mike cables across the bowl to each of the harps. Karl and I were retuning the harps. Karl wanted to experiment with other scales.

Half an hour after we started, Johnny called out to us from across the Hollow. "Karl, Allan, come here, please!"

We hurried over to where he stood, halfway between two of the more widely spaced harps.

"I was walking from that harp over to that one when I stepped over this and felt a draft." He pointed at a pocket in the stone at his feet. It was choked with dirt and small rocks, some of which he had

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cleared away. "Hold your hand over it."

I did and didn't feel anything. I was about to pull it away when an unmistakable puff of air jetted from the pocket. I backed off and looked at the harps to either side. The hole was right between the two of them. "I'll be dipped. . . ."

I ran across the bowl to where two of the harps were more widely spaced than the two straddling the pocket. The ground directly between them was solid rock, smooth as pavement. I moved to a point one third of the way between them and found a pile of rubble half-obscured by a prickly-pear cactus. Moving half the distance from the cactus to the far harp, I found another similar pile. I marked them mentally and walked down to the shelter to join Karl, Johnny, and William.

"Look at the spacing of the harps," I said. "There's a gap where Johnny found a hole and a bigger gap over there where I think I just found two more holes. That leaves a gap right up there." I pointed east. "Who wants to bet there's a hole filled with rubble right there?"

I got no takers.

We found that last hole under one big chunk of rock. I would have lost my bet. There was no rubble. When we slid the flat rock away, a geyser of dust and sand shot into the air.

I paced off the distance between each hole, all the way around the Hollow. There were thirty-one holes spaced equally about the bowl, all the same distance from the center.

"What's it mean?" Karl was interested, but didn't see the significance.

I scratched my head. "Symmetry like this just doesn't occur naturally in nature. I think we have an artifact here."

"Artifact? Someone has made this?"

"I don't know. I just don't know. I know a geologist who might be able to tell me more, but he won't be back in the country for another week."

"If someone made it, what did they use it for?"

"Darned if I know. A primitive observatory? Maybe the holes mark summer solstices and the like."

"Then why the air coming out? And how did they dig the ducting? Those tunnels go through solid limestone and are only half a meter wide. Did they train prairie dogs to dig them?"

I grinned. "Maybe, may just be."

After a great deal of discussion that got us nowhere, we decided to finish setting up. Fifteen minutes later Karl and I saw rock flying

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up from behind the shelter. William was down in the rubble pile heaving loose stone right and left.

"What are you doing?" I asked.

"I dropped one of those cable adaptors and it fell between these rocks. The damn things cost forty-five bucks." He kept heaving stone. I sighed and joined him. The rubble was shallow near the tarp but got deeper quickly. We had moved about two hundred kilos of rock when Johnny said, "Aha!" and fished the adaptor from between two stones. I backed up, wiped the sweat off my brow and stared.

I was tired and the sun was hot, so I don't feel too bad about not seeing it earlier. We'd uncovered another hole—a different hole—an unnatural hole. It was like the mouth of a trumpet or a cornucopia, a meter and a half wide at the surface. It became steeper as you neared the center and its sides were smoother than natural stone had a right to be.

I started flinging rubble right and left, clearing the area so I could see better. Soon I was reaching a full arm's length down into the thing to get rocks. A meter down, the hole had narrowed to twenty centimeters in diameter and my fingers closed on a rock that refused to budge. I wiggled and worried it and found a spot to hook my fingers and yanked. It came loose suddenly and I fell back with my hand still grasping it. Not a rock, but a human skull.

"Oh, my," I said in a very small voice. It was so unexpected, so unreal. The skull held no terror; it just sat there in my hand, a weathered construction of calcium so completely remote from a breathing, feeling man that it seemed alien.

I looked up and saw the other three looking at me, mild shock in their eyes. "Alas, poor Yorick?" I set the skull to the side on a boulder. "Anybody lose this?"

"Who do you think that was?" asked Karl.

I smiled. "Most likely an escaped convict. I don't think the rescue party was very interested in giving them Christian burials. I wouldn't be surprised to find a few more bones scattered around." I stood and pointed at the hole I'd uncovered. "What do you think of this?"

"It looks like an old-fashioned hearing aid," offered Johnny. "The kind used in the seventeen- and eighteen-hundreds."

I looked at the hole. It did seem to curve off toward the center of the Hollow the deeper it got. I knelt and ran a finger along the surface of it. "Very smooth. I wonder how far down it goes?" I clapped my hands strongly together over the opening and listened for an

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echo. Nothing happened. But when I stood, every harp in the bowl shrieked and, where the three holes were blocked with rubble, stone and dirt shot into the air, blasted from the holes like cannon fire.

The harps subsided quickly, dying down to nothing, but in the background I heard different tones also descending in loudness—very deep, bass notes, almost felt rather than heard. Dust swirled in the air and I blinked my eyes to keep them clear. Johnny was coughing his lungs out, apparently the victim of dust inhalation. Karl's expression was a comical mixture of fear and anticipation.

"Please don't do that again, Allan."

My throat wasn't working right. My mouth and lips were very dry. I managed to say very quietly, "Right, Karl. Anything you say."

The harps were still and the dust settled. I stepped softly away from the hole and sat under the tarp. The others joined me.

"Wow. Double wow," said William. "*What* was that?"

I looked at the skull looking enigmatically at me. What do you know, O skinless wonder, that we don't? I shook my head and said, "Maybe the ghosts don't like sharp noises?"

"Do you believe that, Allan?" asked Karl.

"No. I don't know what to believe, but I don't believe that. However, the holes—this whole hollow—is no accident. This *is* an artifact."

"Agreed."

"Karl, I think we should call off this recording session." I looked at him seriously. "Instead we should get archeologists and physicists out here to examine this thing, this phenomenon."

"No, Allan, I can't do that. I've cajoled some very talented people into showing up tomorrow; people who are almost certainly on the road now and unreachable. They are doing this thing for me, without pay or recompense, because they respect me and know I wouldn't ask them out here without a chance at something special. If I postponed, they might not be able to fit a new time in. Nor would I command their respect as much."

I looked back at the skull. "The harps are silent. We may have killed them."

"Plug the 'ear' again. See if that will bring them back."

"Hmmm." I grabbed an empty duffle bag that had held cables and wadded it down into the hole. Almost immediately the harps began again, tentatively at first—then as strong as ever. I grinned at the skull. "Old boy, you've put your head to use these past years.

"Okay, Karl. We'll do it, but first thing Friday I call in the authorities."

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"But of course, Allan."

I got out of bed at midnight and went to the window. Sleep hadn't even pretended to touch me. Behind me I heard the rustle of sheets and then felt hands glide around me. Chris laid her cheek against my back and said, "Can't sleep?"

"Right."

"Wanna talk about it?"

"I don't know what good it would do."

She snuggled closer. "What's up there in the Hollow?"

I sighed. "You heard us at dinner."

"All I heard was a lot of talk about 'acoustical amplification,' 'fluidic transistors,' and 'open column resonance.' That doesn't tell me what's up there."

I turned and hugged her gently. "All those buzz words are things we use to cover our ignorance. I don't know what it is. I suspect, but I know nothing."

"Well, what do you suspect?"

I sat on the edge of the bed and pulled her down onto my lap. "Someone has made a device, a construct, a work of art, a system of ducts through stone. This device has a microphone, speakers, and a power cord. The mike is the horn-shaped hole in the center of the bowl and the speakers are the thirty-one holes spaced evenly around. The power cord is the wind entering who-knows-how-many openings on the escarpment faces and being channelled to the Hollow. With me so far?"

"Yes."

"To further carry this crazy analogy, this device has an amplifier, a section which takes input from this 'microphone' and magnifies it manyfold at the 'speakers'."

"So we're talking about a giant stone hi-fi."

"Sure . . . but I think it does more and I don't know exactly what."

"Okay," she said, head on my shoulder. "Who?"

"No idea, but I'll bet a megabuck it wasn't anybody alive today. Those holes are *old*."

They were young; they were not very well known; and they were very, very good. Many had been Karl's juniors at Juilliard. Some were too young even for that. Marjorie Chambers, the horn player, was seventeen. Leo Bertram, the violinist, was fifteen. Look for them—they are tomorrow's Van Cliburns.

Half of Wednesday morning was spent ferrying musicians and

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their instruments to the Hollow. Karl was everywhere, distributing sheet music, soothing feelings, explaining the general purpose of this odd gathering. By tacit agreement, the Hollow was spoken of as a purely natural phenomenon.

"Allan?"

"Yes, Chris?"

"Do you remember what day this is?"

"Halloween."

"Halloween is the shortened form of All Hallows' E'en."

I was quiet for a moment. "It had occurred to me. Still, they are spelled differently. Hollow versus Hallow."

"True. Interesting though."

"Yes."

I left her with the other flautist and walked over to where Johnny and William were peering at blinking LED's and meters. Since their ears were encased in headphones I said nothing and found myself a seat.

Karl mounted his podium, a square chunk of limestone jutting from the ground, and raised a hand. Conversation died immediately.

The harps gave one quick, nervous run up the scale and died, almost as if they too were heeding the conductor's command. Then, with a quick down beat, Karl led them all into the "Infernal Dance of King Kaschei" from *The Firebird*. My mind, free from the demands of making music, envisioned the demon king whirling to the music. Like flames, the harps flared up, suffusing the melody with a hellish wailing. Now dying down, now roaring forth, the aeolean strings wove a pattern of chords and harmonies around, through, and—occasionally—with the human musicians.

Orchestra and harps built together, climbing torrents of sound, and cascaded into the finale. If there was anything wrong with the performance, it was the final surge of sound the harps gave after the orchestra had stopped. Perhaps they wanted the last word.

Karl smiled hugely, threw his baton over his shoulder, and laughed. "Bravo! That was magnificent!" He shook his head. "I would reprimand the person responsible for that last outburst, but it wouldn't do any good. Let's try the quartet, now."

The majority of the musicians got up at this announcement and made their way in various directions. Most headed for the drinks, a few headed for the toilet, and the rest milled around and stretched. When Karl started the four musicians in Schubert's *Death and the Maiden* Quartet, they all quieted down and made themselves comfortable.

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The harps were not nearly as cooperative for this piece. When a quiet passage was being performed by the quartet, the harps would build to a fast-paced peak. When the quartet was moving strongly, the harps would die to nothing. Still, there were harmonies reached that touched the heart and made one's stomach flutter. There occurred convoluted structures of diminished chord, arching through the air to bridge the gulfs of indifference and solitude we all carry around.

At the end Karl said, "Different, yes? We may try this one again, tomorrow, and see if we get any more cooperation from the wind. Take thirty minutes—then we'll start the solo improvisations."

Karl and I, with the volunteer help of Kelly Leeds, a bass player, began retuning the harps for the next music. Like most of the musicians he was awed by the combination of the harps and the Hollow.

"What on earth caused these holes in a meteor crater?" Kelly asked us.

"What?" I jerked up from where I was twisting my tuning wrench. "What makes you think this is a meteor crater?"

He snorted. "The shatter cones. Can't you see?" He pointed at the rock below us. I bent closer.

The limestone at our feet was marked dimly with cracks—arrows almost—parabolas in fact. They were filled in with sand and worn by decades (centuries?) of wind and water. The arms averaged about ten centimeters in length, and the apex of each parabola pointed back toward the center of the Hollow. Now that I knew what to look for, I saw that these marks occurred randomly all along the rock.

"Here, let me show you." While Karl and I watched, Kelly took a hammer and a chisel out of my toolbox. With several sharp blows he shattered the rock to either side of one of the marks. Then he inserted the chisel along one of the cracks and pried. A section of rock corresponding to the boundaries of the parabola erupted from the surrounding matrix.

Karl gasped. "It's so smooth! Is it an artifact?"

Kelly lifted the piece of limestone to where I could better see it. It was a smoothly-surfaced cone tapering from a centimeter-wide point to a ten-centimeter-wide end. The cone was bisected along one side—the old plane of the surface. The wide end looked as if it was freshly broken from the surrounding stone.

"No," said Kelly. "It's not an artifact. It's an impact fracture. Surely you've seen where a piece of gravel has hit a windshield at high speed? Or where some kid has shot a pellet gun through a plate glass window?"

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We all nodded.

"When a meteor hits, it creates massive shockwaves that travel through the rock. Where these waves hit flaws in the stone—resistance to smooth travel—shatter cones form. They are the second surest sign of a cataclysmic shock."

"What's the first?" I asked.

"Coesite," he said. "A silicon oxide compound, a very dense polymorph of quartz. So far it's only been found at meteor impact sites . . . and nuclear bomb test sites."

"You amaze me," I said. "What's a bass player doing with this kind of knowledge?"

Karl spoke. "Kelly is not a full-time musician. He teaches geophysics at Ohio State University."

I blinked. "How old do you think this crater is?"

"Well, this is Permian limestone. That limits it to less than 230 million years."

"How precise."

He grinned. "Oh, judging from the amount of wear and erosion—the crater shape is still well defined—I'd say less than twenty thousand years and more than a thousand." He shrugged. "Without a thorough study, that's the best I can do."

Something cold crept up my spine and I gave an involuntary shudder. "That old?" I dropped the shatter cone and resolved to keep this from Chris for a while. "We can discuss this tonight. We better finish tuning these harps."

We went back to work with a will and I was very glad when Kelly didn't pursue his original question. Still, I couldn't escape a feeling of foreboding.

Back down among the press of humanity my unease retreated to the back of my mind. Karl gave a lecture on inprovisational melody and chose the first soloist. "Remember," he told Leroy Hansen, a young oboist. "Your melody must provide a framework to contain the harps' music. The harps will supply plenty of randomness, so you must supply order."

Respect the man who sings with the wind. He can neither hold or match its raging tides and soft sighs. He continues, shrunken to insignificance by the pervading, mindless wind. Yet he tries and in trying elevates himself. He gains depth, breadth, life itself in trying something that can't be done. And, to himself, he says *maybe this time, this time I'll do it!* And who knows? Maybe he will.

Leroy's song was like this. His oboe wove a steady path of melody along perilous cliffs. The harps raged and sighed, flinging torrents

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of sound to drive the oboe from its precarious path—the path between boredom and wild disharmony. When Leroy finished there was quiet for minutes. Even the wind died and the harps stood silent.

"That," said Karl in the general direction of Johnny and William by their equipment, "is a take." He shook Leroy's hand vigorously. "Well done." Leroy beamed.

While they prepared for the next set, I brought Chris a ginger ale from the ice chests. She accepted it and gave me a smile worth four thousand thank-yous.

I sat beside her.

"It's working."

"I noticed," she said. "My husband designed all this, you know."

"Oh, really? He must be a very clever fellow."

"Not really. But he's great in bed."

I grinned. My eyes wandered over the mixed company. Karl finished his instructions to Leo Bertram, the violinist, and was waiting for Leo to pick his own beginning. Most of us were settling in to listen. A few stragglers wandered back into the Hollow from the toilet and a few were putting their instruments in their cases. One girl was spreading a sandy duffle bag over her cello to keep it out of the sun.

A duffle bag.

Foreboding returned, flooded back into my mind. I stepped up to her. "Where did you get that bag?"

She looked up, startled at the snap in my voice. "It was over in that hole." She pointed over at the 'ear.' "If it's yours I didn't mean any harm."

I shook my head impatiently and started walking toward Karl.

Leo Bertram began playing.

Karl said he never heard my shout of warning. I believe it. The first crisp stroke of Leo's bow launched song into the air. It was not alone.

The harps spoke first. Sequentially, in sixteenth notes, they marched all the way around the Hollow. Then they stopped and the depths cried forth. My foot was shaking. No, the ground was. A chord, C below low C, came out of the holes—not the harps, mind you—but from the holes, the very earth.

The harps went systematically wild. A note would sound from the holes—a sustained tone with the power and texture of a hundred Hammond organs—and the harps would sound alternately, racing around and around the Hollow, until the tone from the earth

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matched the harps'. Then a higher tone would sound and the whole process would repeat.

My God, I thought. It's learning.

Twenty-seven harps I have and twenty-seven times the earth cried forth and spun the song around. We all stood or sat where we were, spellbound, frozen to the earth by our own fascination. Chains would have held us no better. Then the twenty-seventh harp stopped and the earth grew still.

Leo Bertram played . . . and the universe joined in.

If you believe Nicholas van Rijn, Bach talked to God in mathematics. Who can say? But if this is true, then that day, God talked back.

The Hollow learned fast, and it was no stranger to music. How many years had it played before that skull had made it deaf? One thousand years? Twenty thousand years? How many years had it sung to the sky and the sun and the stars?

Leo Bertram played. Leo Bertram reached down within himself and played as he had never played before. And, from the air and the earth, his song was amplified, harmonized, embellished, countervoiced, and elaborated. A dozen different melodic lines twisted and turned about Leo's, reinforcing and contrasting, highlighting and underscoring the theme.

Then, right from my side, yet another voice entered the grand work. Chris had lifted her flute and was following Leo, straying off into carefully constructed harmonies and returning to the main theme. Marjorie Chambers sounded her horn and Kelly Leeds bowed his bass. Leroy Hansen's oboe threaded its way into the tapestry.

One by one, all the musicians picked up their instruments and joined the work. Karl awoke from amazed stupor and began guiding them, quieting one while bringing out another. He led them on with an uncanny instinct for what would sound best—what would fit and what would clash. I became conscious of a longing, a desire to contribute something. I clenched my fists and listened, remembered, watched, and wondered.

I felt like the little crippled boy watching all the children leave with the Pied Piper.

On the music went, building, driving, gaining momentum. The earth shook and small rocks danced in the Hollow. The sound of the earth organ surrounded, enveloped, vibrated from the ground and into my bones. The harps soared, high above the bass notes that shook my feet. The orchestra drove on, reaching for the best, the greatest, the perfect expression of their art.

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And finally, the climax came, a thundering, tumultuous, roaring thing that would have done Beethoven proud. As cleanly as if the piece had been scored for their eyes to follow, the orchestra and the harps and organ finished, with a clash of cymbals and earth-shaking thunder.

And yet the earth still shook. The musicians began looking around them, slowly stirring, dazed. The shaking continued, worsened. Small cracks began running across the floor of the Hollow. A small boulder rolled down from the lip of the Hollow and smashed into the ice chests.

I grabbed Chris and pushed her up the slope to the Hollow's edge. "Get out of the Hollow!" I started grabbing people and pushing them after her. "Leave this place! Get over the lip!"

A really sharp shock knocked several of the musicians to the ground. They scrambled up the slope as best they could—some staggering as they ran, some on all fours. Everyone was on their way out of the Hollow but William and Johnny. They were struggling with the recorders.

"Leave it! Let's get out of here!" I staggered into William as the ground heaved.

"The tape! We've got to save the tape!" William finished rewinding, grabbed the reel, and started up the slope. Johnny and I followed.

Behind us I heard the ground groan. Suddenly my shadow sprung out in sharp relief before me. I reached the lip of the Hollow and turned around.

A brilliant shaft of white light had erupted from the center of the Hollow and was spearing the sky. As I watched, it became wider. The rock around it was flowing, glowing red. The shaft of light died and a rounded, blackened cylinder slowly rose out of the wrecked remains in the center of the Hollow. The ground buckled, taking me to my knees, and the center of the crater exploded.

I threw myself to the ground and covered my head. I heard a roaring and through my closed eyelids light stabbed my eyes. The noise died quickly and the light faded. I rolled over and over to smother the flames dancing on my back. When I could look up, all I could see was a blazing star slowly fading in the afternoon sky.

Kelly, *à la 2001,* says it was a remote probe, a searcher for intelligent life. He maintains it was waiting for that moment in our species' history when we could produce complex music and react to and interact with its music—a moment that would have come much

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sooner, but for the accident of the Hollow's location. Once this level was reached, it left, to bring the news to its creators.

Though I would like to believe this, I'm reluctant to gift the mechanism with such an easily-understood purpose. Instead, I'm reminded of a hermit in the wilderness, scorning his fellows, his peers, to play a wooden flute for his own pleasure, or his god's. Perhaps even to echo the unthinking song of brook, bird, and wind? I could see the Visitor, like the hermit, fleeing the encroachment of civilization, our own simple music.

I suspect the truth is much stranger.

It was Karl who offered the most attractive explanation.

"It's simple. A concert musician should see it immediately. You arrive in town, you set up your equipment, and you have a short rehearsal with the local symphony. Then you perform the concert. What could be more natural? So what that it had to wait ten thousand years for the back-up group? I feel I've waited almost that long at times. And of course the schedule is tight, you've always got to rush to make that next concert, that next stop on the tour. You can't always wait for the applause."

What can you say? What level of technology is required to build a craft that can survive a meteoric impact with solid rock and remain functioning for many thousands of years? We have many questions, and no one to answer them.

The last of the musicians had said goodbye, winding their wondering way out of my home. Tomorrow would lend distance and perhaps a dreamlike quality to the impossible that was. Karl and I sat in the living room lost in thought and memory. Chris brought three glasses of wine on a tray.

"Something for the road, Karl," she said.

With my left hand, I picked up the tape canister from the coffee table. With my right, I took a glass and stood.

"To the South wind." I raised my glass.

Karl looked up at the tape and sighed. For a moment his face was haunted by something sad and wondering, then, exorcising it, he smiled. He collected his glass and stood.

"To the West wind," he said.

We raised our glasses to the west.

Chris lifted her wine. "To the East wind."

"And to the North wind," I finished and drained my glass.

A companionable silence took the room. Setting the tape carefully to the side, I sat on the couch and gathered Chris close.

"Allan?"

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"Yes, Karl?"

"There is this flux I've read about lately, from the sun. Particles that vary with the season and magnetic fields of the Earth."

"That's right, Karl."

"Could you make an instrument that would respond to this solar wind? How much does it cost to send something into orbit on the space shuttle? How much to send something up on Ariane?"

I turned slowly to face him.

"Karl?"

"Yes, Allan?"

"Goodnight."

In the desert the wind plays tunes on the telephone lines and barbed wire fences. It whistles through nooks and crannies and carries sand to make castanets of worn bleached wood. And it sings songs to make Caruso cry.

THIRD ANSWER TO TITAN'S LOCH METH MONSTER (from page 92)

1. 2,000 pounds.
2. 666 and 2/3 pounds.
3. Zero.
4. The square root of 2,000, or 44.721 + pounds.

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LETTERS

Letters to the editor are always welcome . . . encouraged, in fact, since without them we have no way of telling how we're doing. Send them to Box 13116, Philadelphia PA 19101. Letters about subscription problems should go to a totally different address: Box 1933, Marion OH 43305. This is very important, because those of us in Philadelphia can only forward your letter to the circulation department, and that takes extra days which might otherwise be spent straightening out your problem. Letters on other matters such as advertising, back issues, single copy orders and the like should go to the appropriate department at Davis Publications, Inc., 380 Lexington Avenue, New York NY 10017. Newsstand distribution information is of special interest to us. If you're having trouble finding IA'sfm *on your local newsstand, please let us know, at either the Philadelphia or the New York address.*

On a couple of other matters: To all those of you who wrote in for our editorial requirements and format sheets **before** *sending in your manuscripts, Merry Christmas. To those of you who plunged ahead and sent manuscripts without our information, well, you probably found a lump of coal in your Christmas stocking. (Christmas? Well, as I write this, it's mid-December, and snowflakes are dancing on the sugarplums. Or something.) Anyway, these valuable pieces of information can be yours for only 30¢. One 15¢ stamp on an envelope addressed to us, and one 15¢ stamp on an envelope addressed to you. Enclose a note saying, "Please send me your editorial requirements and format sheet," along with aforementioned self-addressed stamped envelope, and they shall be yours. What a bargain! Order now, before (postal) rates go up! This offer* **will** *be repeated.*

—Shawna McCarthy

Dear Dr. Asimov,

It Finally Happened!! I caught Martin Gardner making A Mistake!! In the October issue of *IA'sfm* Mr. Gardner poses a simple problem related to the Giant of OZ. The Giant has a hammer that it strikes on the road with a loud bong. The time between each bong is given as two seconds. Mr. Gardner asked for the time that elapses "between one bong and the hundredth bong that follows". The answer given is 198 seconds, which happens to be the time that elapses between bong #1 and bong #100. However, that is not what he asked for! To me, the above quote clearly asks for the time between

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bong #1 and bong #101, which is 200 seconds. Well?

I was glad to see Dr. Jeppson make her *IA'sfm* debut. So when will we see a collaboration between the two Asimovs?

While I have your attention, I would like to request that you send me your "writers info" sheet in the enclosed SASE. I have refrained from requesting this until I had something to send. I now have something, so here's my request.

Sincerely,

James W. Williams
Lanham MD

P.S. Just because Mr. Gardner made a little mistake, I do not think he should be OZtracized.

I remember I once defined 10^3 as ten multiplied by itself three times. That was wrong, for it is $10 \times 10 \times 10$, ten multiplied by itself twice. After that was pointed out to me, I defined 10^3 as "three tens multiplied together." Semantics can be even trickier than math.

—Isaac Asimov

Dear Sirs,

A few comments about the November, 1980 issue.

I found Dr. Asimov's editorial interesting but useless. Having read both *In Memory Yet Green* and *In Joy Still Felt* I find they need no explanation. Those to whom you are explaining probably don't read *IA'sfm* so the discussion is lost. To those who read the magazine, no explanation should be necessary.

"Laughing Man," by Sydney J. Van Scyoc. I have enjoyed every story in the short series. This tale is no exception. I don't claim them to be exceptionally praiseworthy, just enjoyable to read. Keep it up, Sydney.

"Slowly by, Lorena," by John M. Ford. John, would you quit teasing us with these short looks at Alternities Corp? All three of the stories I have read (is that all, so far?) have been excellent; but, as I said, they teased me. I want more! In a big chunk! Where's a novel, John?

I can't make any comments about "What's Wrong With This Picture." I can't get the tongue out of my cheek enough to type.

"Catch the Sun," by Barry Longyear, was by far the best story in the issue. Despite its excellence, in comparison, it lacks something. It's not quite Longyearish enough. I am really disappointed in myself

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for feeling this way. No author can create perfection every time. Why did I expect something else from Barry? Why did I expect another "Enemy Mine" when his pen touched paper? Maybe the ending was *too* predictable (I don't like complete surprise every time, either). Or maybe the story line wasn't satisfactory or powerful enough. I just don't know!

Are there any Momus stories in the works? I am one of the few remaining fans of the Circus-world stories. I have heard there is a novel in the works, or is it just a collection of the stories. Either way, is it true and when can I expect them? *(It's true. Berkley Books, available now.)*

One question outside your magazine but still inside the world of science fiction. Have you heard what has happened to *Galileo*? I received a copy in December, 1979 and none since. My subscription was paid up for another year, but three letters of inquiry to their editorial offices have acheived no results. I know you guys (and gals, Shawna) kind of keep track of each other. I just need to know if *Galileo* has folded or what? I'll take it from there.

Thank you,

Timothy L. Goehner
7502 E. Coolidge
Scottsdale, AZ 85251

The latest we have heard is that Galileo *and* Galaxy *have both suspended publication. Between rising costs and difficulty in distribution, there are no rose gardens for anyone.*

—Isaac Asimov

Dear Mr. Scithers:

I have finally decided to write for several reasons. Firstly, of course, is to say that your magazine is my favorite SF periodical. Secondly, I thought you might be interested in your European distribution. I am an American who has been living in Britain and Norway for two years now. I've had no trouble finding your issues each month in either country. They're easy to find in London, Edinburgh, and Oslo, and in many smaller towns that have universities. Indeed, on a recent trip to northern Norway, I picked up an issue in the town of Tromsø, some 200 miles north of the Arctic Circle (yes, it has a university, and it *is* spelled with an "ø"). The issues sell for about $2.40 in both countries.

Thirdly, I want to give my opinions on your Sept. and Oct. '80 issues. Excellent stories were "Guardian," "A Spaceship Built of

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Stone," and "Hot Pursuit" (Sept.) plus "The Wheels of Dream" and "Peregrine: Perplexed" (Oct.). Most of the rest were fair to good. However, I want to cast a strong vote against any more "Nurse Tarkington" stories! It may not be easy to write from the point-of-view of a naive, childish, and silly nurse, but unfortunately the stories come across as just that—naive, childish, and silly. I hope Mrs. Webb will direct her talents to other types of stories in the future. I would also like to request more of the non-fictional essays you have once in a while—Milton Rothman's article in the Sept. issue was excellent, and I wouldn't mind one such essay per month. Also, I plead for you to limit your one-page "pun" stories to one-an-issue. Please! I enjoy them, yes, but my stomach can't handle two at a time.

Finally, I would like to request one of your information sheets for manuscripts (you knew I was coming to this). Like so many of your readers who write letters, I write in my spare time, and would like to try submitting one of my efforts.

Tusen takk (a thousand thanks), as they say in Norway.

Sincerely,

Paul H. Yancey
Oslo, Norway

P.S. Despite my best efforts, my wife (who likes your magazine, too) continues to say (shudder) "sci fi." It is killing me! Can you suggest a cure?

We're glad to hear that we circulate in the land of the midnight sun. It is to be hoped we add a bit of light to the area especially at the winter solstice when it becomes the land of the noonday night.
—Isaac Asimov

Dear Mr. Scithers,

Although I really enjoy reading the light poetry featured in *IA'sfm* (and occasionally try to write some for you), the poem "Meeting Place," by Ken Duffin (p. 76, Nov.) is the best poem I've seen in your magazine. It's lovely.

Did you know that Ken Duffin won the 1980 Writer's Digest Grand Prize in their annual writing competition? His poem, "Estrangement in Black and Gray," took first place in the poetry division and was chosen Grand Prize Winner over the first-prize winners in the other catagories (non-fiction and fiction). It must make you feel good to

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know that yet another award winner has appeared in the pages of *IA'sfm.*

Kathleen Taylor
Box 19 SharWinn Ests.
Redfield SD 57469

It does make us feel good. It also makes us feel good that we can recognize a good poem even without it being stamped "written by an award winner."

—Isaac Asimov

Dear Dr. Asimov, et al:

Please send me your format of story needs and requirements, as once more, I'm attempting to sell a story to yet another magazine in the ever-expanding speculative fiction field.

I have been an SF fan(atic) since I first opened a book at the tender age of six. At seven, (when the black squiggles on the pages began to make sense) I picked up a copy of *Amazing Stories* in Grand Central Terminal one fateful night. The rest is history. . . . I was forever hooked! Now I find that I have a habit stronger and more deadly than any drug known to man! What is even worse—this habit doesn't satisfy itself with just an occasional dose . . . it becomes more and more demanding with time (and new publications such as yours).

I have to say, in all honesty, that your magazine is terrific! Your story material is diversified (unlike your sibling *Analog*, which still tends to rely on "hard" SF) and your range of authors, both known and unknown, is a joy to we unpublished fledgling writers.

I am a particular fan(atic) of your letter column, which I find to be stimulating, thought-provoking, and jest plain fun! Sometimes the letters are (almost) as good as the stories.

Well, enough of this philosophising . . .

Thank you for your interest, patience, etc.

Hoping to hear from you soon, I remain

Sincerely yours,

Lesley Shapiro
26 Lakeview Ave.
Scarsdale NY 10583

I always say that science fiction is like oxygen. Try it once and you're hooked for life. My theory, though, is that anyone hooked before

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13 is bound to try to write the stuff. Have you never felt the urge?
—Isaac Asimov

Dear Dr. Asimov:

I read through "Peregrine: Perplexed," by Avram Davidson in your October 1980 issue, before I read your editorial (nothing personal), and at first I thought it was ironic that you were talking about stories just like "*Peregrine: Perplexed.*" Then I realized, by God, this is not a coincidence, he is apologizing (well, "not actually apologizing," as Mr. Davidson might say) for this very un-Isaac Asimov story being printed in (printed in? it was over half of !) Isaac Asimov's magazine!

It *is* a very un-Isaac Asimov-type story, and in my opinion differs from the "storytelling" type in exactly the way analyzed in the editorial.

Maybe you do want variety, and maybe readers' tastes differ. But here is a vote for the clear, absorbing, storytelling type story (of which you, Dr. Asimov, are a king!). And if you have to stick some artistic variety in, please! Mr. Scithers, don't take up half the magazine with it!

And by the way, thank you for a great magazine and keep up the good work.

Sincerely,

Henry Lee Morgenstern
Key West FL

P.S. One scientific question for Dr. Asimov, please. On page 23 of "The Wheels of Dream" in the October issue, a 5′-5″ man, in 1/500 gravity, rebounds off the ceiling toward a glass terrarium. I quote: "He need have done nothing; he did not weigh enough to strain the glass." Is this not incorrect physics? He may have *weighed* only four and a half ounces, but his inertia, or momentum, would be based on his mass, not his weight, and he would have smashed the terrarium to smithereens. If I am right, the story repeats the error elsewhere as well. Am I right?

Your point on mass versus weight is a valid one. We missed that. Your point on my apology is an invalid one. I never know for certain in which issues my editorials appear since I do them well in advance and George may shuffle them when it seems advisable.
—Isaac Asimov

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Dear Doctor Asimov,

I read a couple of issues of your magazine about two years ago and wasn't much interested . . . I'm a big fan of yours, and figured if a magazine is called *Isaac Asimov's Science Fiction Magazine* then at least 50 percent of its contents should be *BY* Isaac Asimov, otherwise it isn't Asimov's. When I first saw your magazine I thought I had discovered a source of new Asimov stories every month. But no such luck.

Now I pick up your November (1980) issue. Oh, joy! Still no new Asimov stories, but the Barlowe cover was a delight, and the stories by Ford and Roberts, plus "What's Wrong With This Picture," were delectable.

Listen, Doctor: That poem "The Centaur" in your November issue was absolutely positively the funniest thing I've ever read. Anywhere. Period. Hilarious. Who in heck is this F. Gwynplaine MacIntyre, and could she (he? it? they?) please do another poem like this right away? If this is how he (she? they? it?) normally writes, I'll buy every issue of your fershlugginer magazine that she (they? he? it?) writes poetry for. Funny, funny.

"Catch The Sun" was OK, but "Laughing Man" was plain dumb. More John M. Ford, please, and if you keep printing stuff as funny as "The Centaur" by F. Whatsisface MacIntyre—obviously a pen name—then you've got a steady customer for life.

The Algis Budrys article was nice, too. Who the heck would come up with a name like Gwynplaine?

May The Force be with you!

Amy Krumgold
Brooklyn NY

I'll tell you who F. Gwynplaine MacIntyre is. He's the best darned writer of light verse in the world. If he supplies us with 13 a year as good as "Centaur" or even nearly as good, we will run him every issue.

—Isaac Asimov

Dear George and Isaac:

Having received my December issue in the mail today, I turned to the letters column and cringed! I had forgotten all about that letter which I wrote to you five months ago. You really surprised me by printing it, but at least I got a few questions answered on the

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subject of rejections. Needless to say, I've grown since then (gosh, that was long ago, since the published story mentioned was published last month in *Mike Shayne*) and I submitted the story in April!

I have, incidentally, reread *The Elements of Style* and I do see how that book can come in handy. Strangely enough, I recommended the same book to an unpublished writer and he was insulted becaused he thought I was insinuating that he was of an amateur status. Can't win!

Thought you might like to know that with my first check for the short story sale came a fan letter from Jon L. Breen, who does the book reviews for Ellery Queen and is quite a good writer himself. If I get some bad reviews on the story, Isaac, I'll re-read your editorial this month on "What makes Isaac run?" and grin and bear it.

Looking forward to seeing the magazine come out more often and by the way, whatever happened to the Adventure magazine?

Best wishes,

Vicki Carleton

P.S. The point in my objection about "You'll be re-reading it a lot," is it seems to personalize things. I thought (at the time) that a "We recommend all writers serious about their craft to re-read *The Elements of Style,* more appropriate, but I could be wrong.

Some writers seem to be irritated by having the best book on English style recommended to them, but all of us can always find something to learn in it. (Even I.)

—Isaac Asimov

NEXT ISSUE

The July 6, 1981 issue of *IA'sfm* will feature "Exposures," by Gregory Benford, author of *Timescape* (Simon & Schuster), in his first-ever appearance in our pages. Also in the issue is an "Adventure in Unhistory" by that well-known Unhistorian, Avram Davidson, a new novella by Sharon Webb, and more on the fictional(?!) Pshrinks Anonymous by J. O. Jeppson. On sale June 9, 1981.

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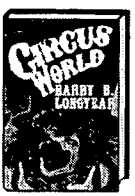

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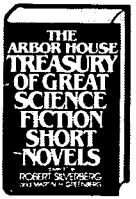

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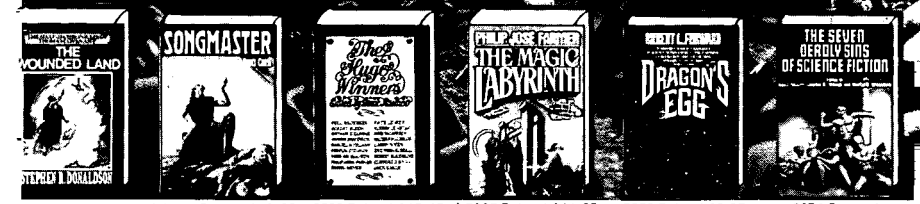

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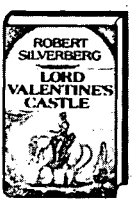

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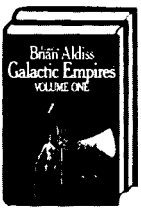

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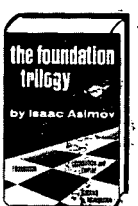

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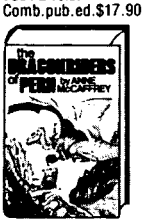

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